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Molding Franklin Cylinders

By FRED H. COLVIN
Editor, *American Machinist*

The coreboxes and cores for the various parts — Inserting the cooling strips or vanes—Assembling the cores into a complete mold

THE MOLDING of the average internal-combustion motor cylinders with the water jacket and intricate coring, was formerly considered quite a feat in the ordinary foundry. The experience of the past twenty-odd years has, however, developed such work into a matter of ordinary routine and cylinder castings of the water-cooled type, present no special problems at the present time. The air-cooled cylinder with its axial or radial fins, is an entirely different matter and one which the average foundry knows little about.

The H. H. Franklin Manufacturing Co., pioneers in the development of the air-cooled motor, has been almost alone in this field. And having very effectively placed the air-cooled motor on the map in spite of tremendous odds, it is placing its experience at the disposal of others who may be in search of such information. The methods about to be illustrated are the result of long years of patient work in which the foundries making the castings have given aid to the Franklin engineers in every possible manner.

Beginning with a view of the various cores used, as in Fig. 1, the ten cores are as follows:

A = Core for main bore
B = Main-head core
C = Intake-cover core
D = Exhaust-cover core
E = Intake-port core
F = Exhaust-port core
G = Collar core for pouring
H = Insert for narrow fins
I = Filler in main-head core
J = Core for venting mold.

The way in which the head cores are assembled is shown in Fig. 2, the various cores being lettered in the same way so as to avoid confusion, while Fig. 3 shows the core box in which the head core is made. The base core which makes the bottom of the cylinder with its flanges for bolting to the engine crankcase, is shown in Fig. 4. The base core will be seen later in the assembled cores for the complete cylinder.

The special feature of the Franklin cylinder is the

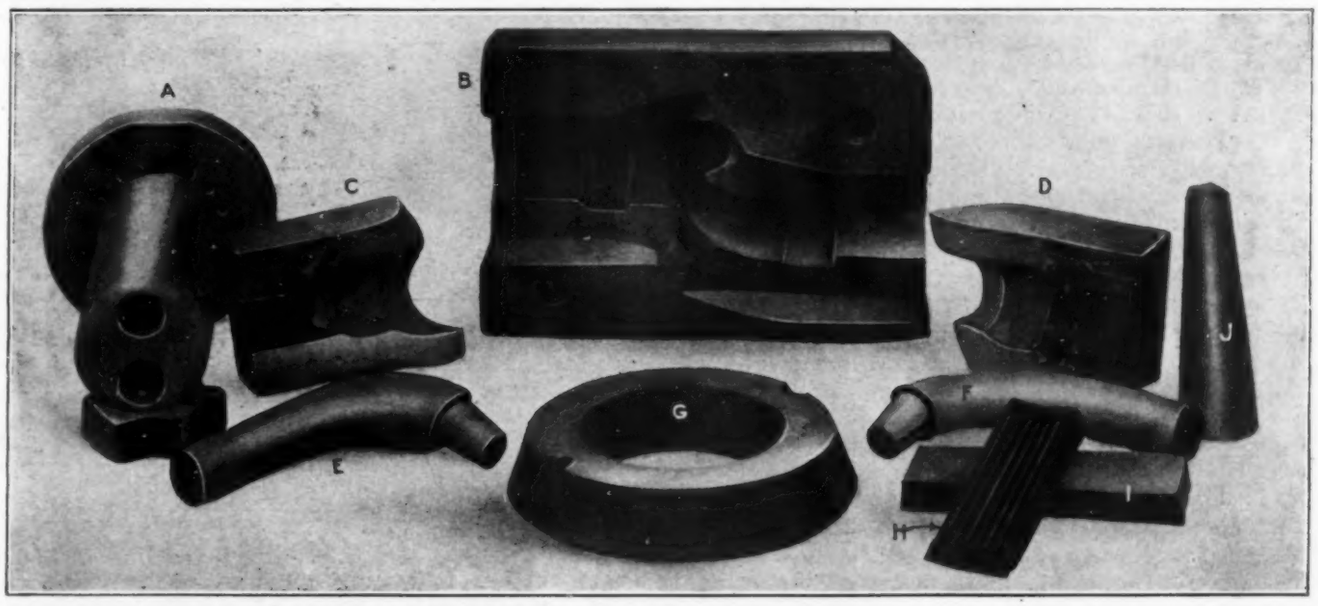


FIG. 1—CORES USED IN MAKING THE MOLD

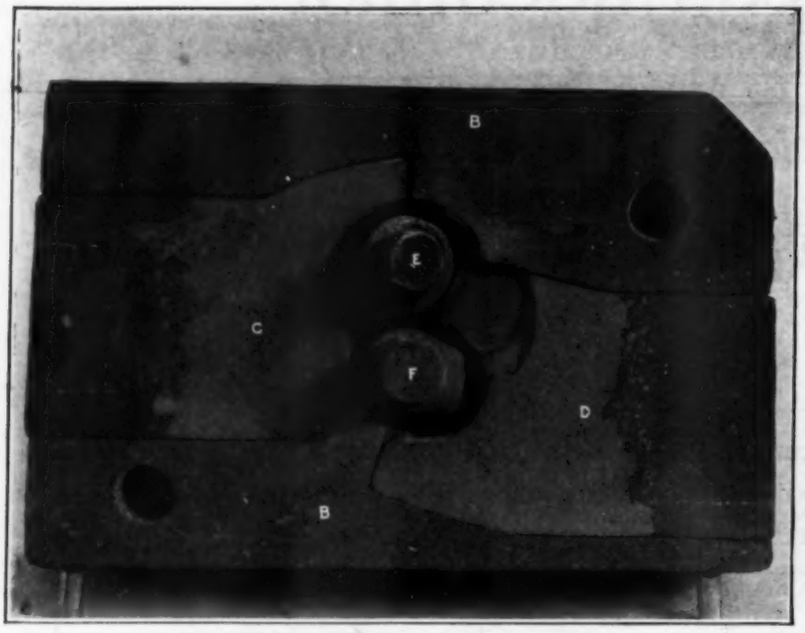


FIG. 2—THE HEAD CORES IN PLACE.

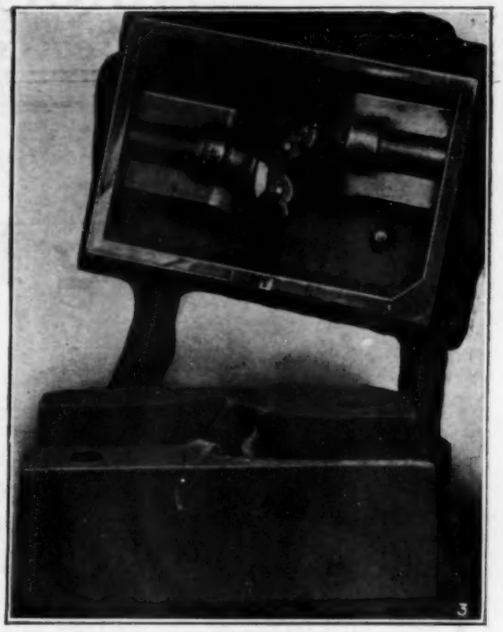


FIG. 3—CORE BOX FOR HEAD CORE

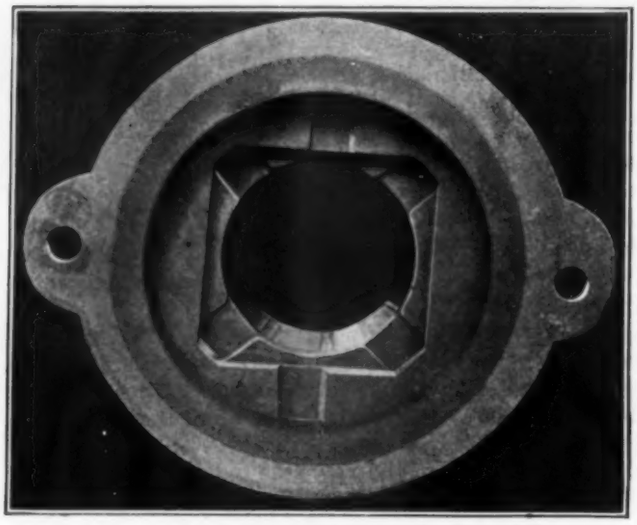


FIG. 4—NECK AND BOTTOM FLANGE SECTION

way in which the cooling fins form a part of the cylinder wall. The cooling fins are of sheet steel, approximately $\frac{1}{16}$ in. thick and must be completely united with the cylinder in order to secure the maximum effect in radiating the heat due to combustion within the cylinder.

Concentricity of the cylinder wall and a perfect union of metal between the fin and wall, coupled with the depth (only $\frac{1}{16}$ in.) which the fin can set into the cylinder casting, makes a nice problem in molding and core making. The cylinder wall itself is but $\frac{1}{16}$ in. thick when finished or only $\frac{1}{8}$ in. below the bottom of the fin.

In order to secure such accuracy as this is it is necessary to use machined mandrels for setting the fins. One of these mandrels is shown at A, Fig. 5. At *B* is a mandrel with all but the last piece in place and at *C* is the completed assembly of the mandrel with the long or L-shaped fins and also the core *D*, containing the short fins as shown at *H* in Fig. 1.

The mandrel is placed in a sort of flask and sand rammed around and between the fins. Then the mandrel is withdrawn by means of the special lifting device shown in Fig. 6 which pulls it straight out of the mold and eliminates any side motion which would be present if it were lifted by hand. The appearance of the mold after the mandrel is withdrawn is seen in Fig. 7, which shows the space between the fins filled with sand and the projecting amount to be cast into the cylinder wall.

A Nearly Completed Mold

A mold which is almost completed is seen in Fig. 8 where the core (*A*, Fig. 1) which forms the bore is being lowered into place in the neck section *B*. Below this is the fin section *C*, while at the bottom is the

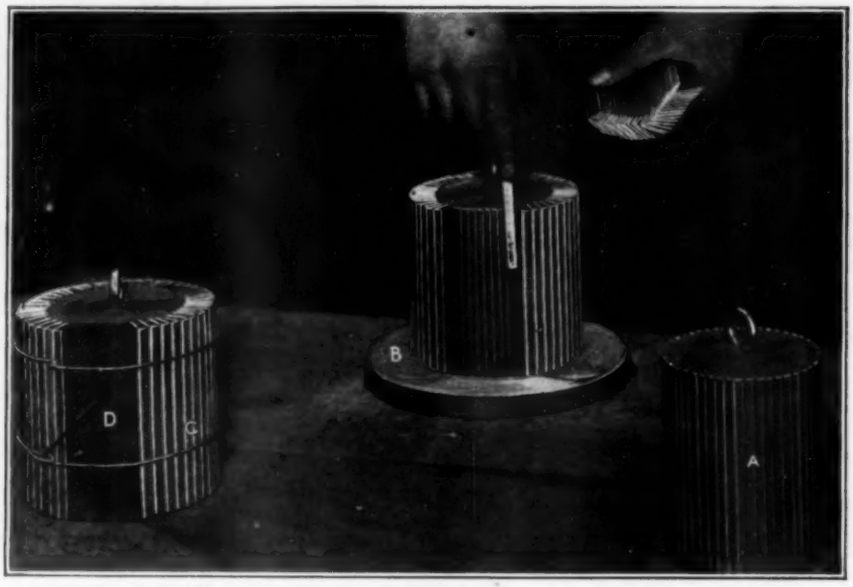


FIG. 5—SETTING FINS ON THE MANDREL

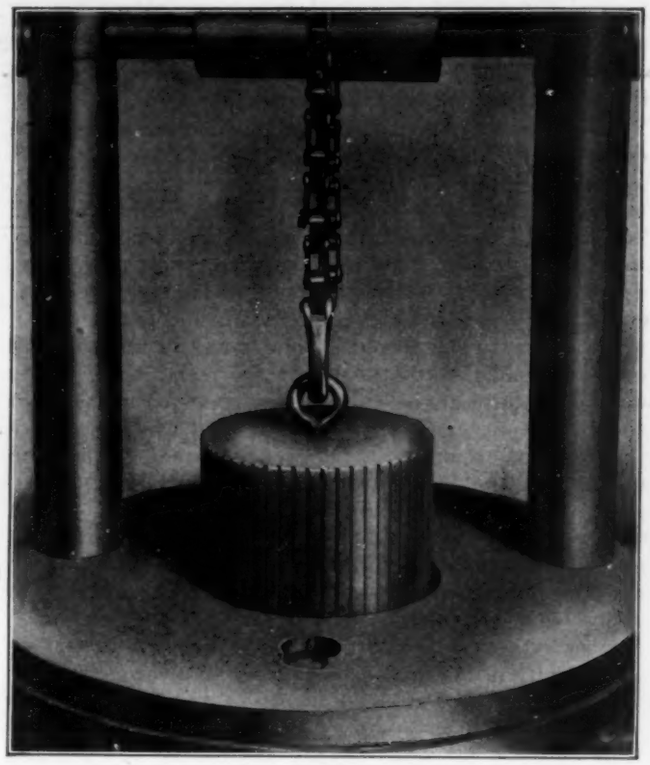


FIG. 6—WITHDRAWING THE MANDREL

main-head core-assembly *D*, which was shown in Fig. 2. The mold at the right shows the collar core *G*, in place for pouring and also the vent core *J*. As the present output requires over 400 cylinders a day, it is obvious that a goodly array of flasks and mandrels for the fins must be available in order to keep up the output.

The completed cylinder is shown in Fig. 9, the side with the short fins being in evidence. It will be noted that the fins are L-shaped and that the bent-over portion bears against the next fin so as to form a wedge-shaped opening or flue the whole length of the finned portion of the cylinder. These flues direct the air blown from the fan and in this way insure a constant and evenly distributed stream of air owing past the cylinder. It is the care in design and manufacture of the cylinders that accounts for the success of air cooling, which is one of the main features of the Franklin motor.

FIG. 7—FINS SET INTO MOLD

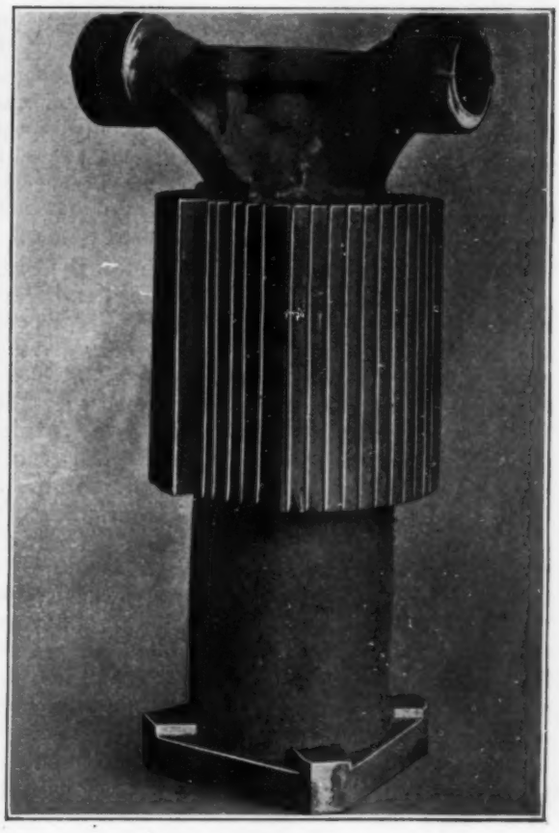


FIG. 8—ASSEMBLING THE MOLDS. FIG. 9—COMPLETED CYLINDER CASTING

Simplicity in Machine Design

By Entropy

The earliest stages of machine design were crude so far as mechanism is concerned, but they were filled with architectural ornamentation. As the ornamentation was dropped the complexity of the mechanism increased until now it takes the builder of a machine to get it to pieces when it is repaired.

There are two classes of offenders in this regard, one the engineering graduate who thinks that unless the machine he designs is intricate, he is not earning his salary, the other the so-called practical man who can only design a new machine by adding something to an old one. If the technical man could be persuaded that it is worth more for him to make his designs simple, and if the practical or self-made man could be persuaded to study principles of design rather than details, we might get more effective machinery with less complication, fewer parts, greater capacity, and less time lost for repairs and adjustments.

By this it is not meant that either man can use a great deal of what is known as machine design in the colleges, for most of that can be of but little use in ordinary every-day work. The one part that both can use is that applying to mechanical motions. There are of course only a very few fundamental motions, but their combinations and variations are sufficiently numerous so that it is a real study to make oneself familiar with all that are usable.

Application of Mechanical Motion

Once the most simple, effective motion is found to accomplish the desired result, the next thing is to put that motion into the design in such a way that the dismantling will be obvious. Written instructions may accompany the machine when it is first sold, but as a second-hand machine later on, or even in the original shop if the foreman goes away and carries the instructions with him, there is likely to be real trouble, and perhaps a damaged machine. And, a machine damaged through ignorance is just as poor an advertisement of the firm that built it, as one that was not built right in the first place. Concealed mechanisms, keys that must be loosened by means of a screw that is a foot away from the key, are a productive source of just such troubles. No one seems to connect the screw head with the key, the screw is not loosened and a spindle is sprung out of true in trying to get it out. Then, there are all kinds of trick feed gears, geared driving mechanisms, turret turning devices and so on that seem to have been designed to see how much work could be sent into the shop. All these complex mechanisms cost money, not the money that is paid the designer alone, but the extra cost of making each machine and the extra cost of every repair job done on a blind part.

And then, there is the employer to be considered. Every additional complexity, every machine that cannot be assembled without hoisting it up with a crane so a man can get under it and every additional dollar consuming device, subtracts from the net returns from the plant. A few firms send their draftsmen into their pattern shops, a very few let them look into the foundry and a few more let them follow their work through the machine shop, but the great number of draftsmen, if they want to learn anything about how their work has to be used, have to find out of their own initiative. Because it is one of the few instances where superintendents seem to be so afraid that a few dollars extra will be spent in the drafting room, they take away the chance to hold the drafting room truly responsible for things which could have been made simpler.

It is a simple thing to learn to be a mechanical draftsman. All that is necessary is to know a little about projections, something of conventionalities and acquire some dexterity of hand. But the employer who hires that kind of a draftsman gets only what he pays for. If he wants drawings that can be worked from, details that can be readily duplicated in wood for patterns, details that can be molded in the foundry with a minimum of loose pieces and cores, and that will come out sound with the least labor, and if he wants drawings that can be used in the shop with the least special set-ups and with more metal backing where the most metal is to be removed, he wants something more than the mere draftsman mentioned above can give. Really, there should be a special name for a man who works in the drafting room, but brings with him a working knowledge of the foundry, the pattern shop and the machine shop, and who is willing and able to apply what he knows to the conservation of profits.

It is rather too much to ask of a draftsman that he take the time off at his own expense to acquire these knowledges. A few have done it, but the majority really cannot, if they will. They are married men, they have children to support, they are paying for a home. They cannot even afford the luxury of being sick. To be sure, they may take correspondence courses and many do, but there is a great deal more in actually working in the shop and getting the feel of a rammer, and a chisel and a scraper in the hands, than there is in reading the best description that can be put on the printed page. Employers may very well consider the desirability of intentionally using some of the time that their draftsmen are now spending rubbing out attempts at design, in the shops where they will learn that which will enable them to use the pencil more and the eraser less.

A Problem in Depreciation

By A. W. Forbes

What is the proper rate of depreciation of a lathe? Some say 5 per cent annually, some 10 per cent, some higher, basing their rates on the opinion that the lathe will have sufficiently deteriorated that there will be more profit in buying a new one than in keeping the old one, in 20 years, 10 years, or less.

We started business nine years ago with one lathe. During the first five years it required a certain amount of repairs, the countershaft in particular needing occasional attention. During the last two years the only repair required has been to replace one small gear broken by accident. It has given better service during these last two years than at any other time during its life.

This lathe may have received better care than is often the case in production work, but no better than should be given by any skilled mechanic. The present operator was given the lathe two years ago after one year's machine shop experience. While he has had general care of the lathe, it has been used also by a number of inexperienced boys.

If after ten years a lathe gives better service than it did when new, and the maintenance costs are less, what has been its rate of depreciation?

Railroad Salvage and Other Shop Work

BY S. ASHTON HAND
Associate Editor, *American Machinist*

Reclamation of materials—Substitute for a turntable—Milling teeth in a spherical cutter—Making brake hangers on air operated bull dozers—"wheeling" a locomotive

RECLAMATION and utilization of scrap is always a problem in any shop, but in a railroad shop the problem often becomes serious, especially when tangled masses of wreckage such as shown in Fig. 1 are shipped to the shop in carloads. The cars must be unloaded promptly and a place found to store the bulky material which becomes a nuisance and sometimes a menace if allowed to accumulate.

At the Emerson Shops of the Atlantic Coast Line R.R., South Rocky Mount, N.C., the set of rolls shown in Fig. 2 is used for straightening and reconditioning round rods of various sizes. These rolls have proved their usefulness in more ways than in the reclamation of scrap. During the war when material of all kinds was hard to get, this shop found itself badly in need of round bars while it had an overplus of square bars. The square bars were heated and converted into rounds by passing them through the rolls. While this method was an expensive one the expense was amply justified by the emergency.

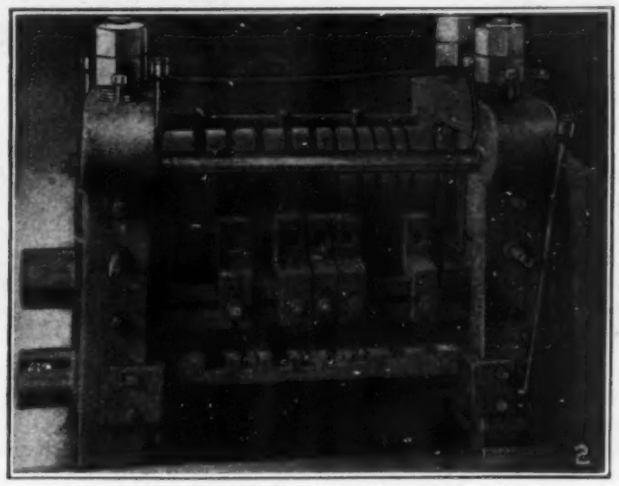


FIG. 1—A CARLOAD OF TANGLED SCRAP. FIG. 2—ROLLS FOR STRAIGHTENING BENT BARS

Car axles vary in length for different classes of equipment and axles with journals so worn that re-turning would bring them below the minimum allowable size are heated and the journals upset. The axles to be seen lying between the tracks in Fig. 3 have been so treated and will have the upset journals re-turned to standard size and the length made to suit another class of equipment.

In the case of worn driving-wheel axles it would hardly be possible to re-turn them for use on engines of smaller size, as the difference in diameter would not permit the entire obliteration of the keyseats for the driving wheels and eccentrics. While such "witness marks" would probably not do any harm, the use of such an axle would be considered as sloppy practice and would not be tolerated except in a grave emergency.

One of the uses that can be made of worn driving-wheel axles is to make crankpins from them as shown in Fig. 4, where an axle may be seen in the lathe being converted into crankpins.

The yard of a railroad shop must be arranged for transportation of all kinds and, where push-cars are used on and across tracks where locomotives and standard cars must be run, it is necessary to provide some means for changing the direction of the lighter equipment so that it may serve all parts of the yard. If the majority of the trackage did not have to be used by locomotives and standard cars it would be an easy matter to install a number of light, cast-iron turntables such as are used in industrial equipment, but such turntables would not stand up under the heavier traffic.

The problem of shifting push-cars from the main tracks in the yard to tracks laid in other directions has been solved at this shop in a very simple and efficient manner by placing at the track intersections a series of air lifts or jacks, one of which is shown in Fig. 5 at *A*. The push-cars are fitted with bolsters beneath the centers of their decks for the air jacks to push against. In Fig. 6 is shown one of the cars with the wheels raised clear of the rails. In this position the car can be turned and lowered with the wheels on the cross track. The controlling valves for the jacks are placed in sunken boxes between adjacent tracks. When the car is lowered onto the tracks the

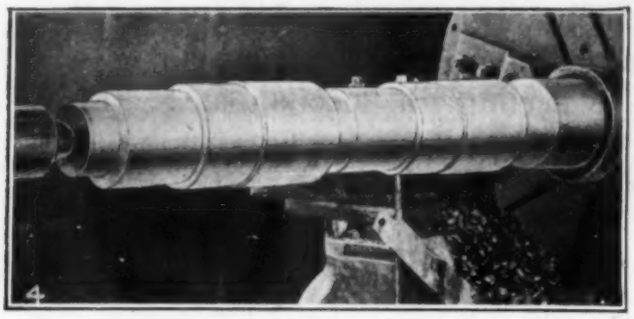


FIG. 3—CAR AXLES THAT HAVE BEEN UPSET. FIG. 4—MAKING CRANK PINS FROM AN OLD DRIVING AXLE

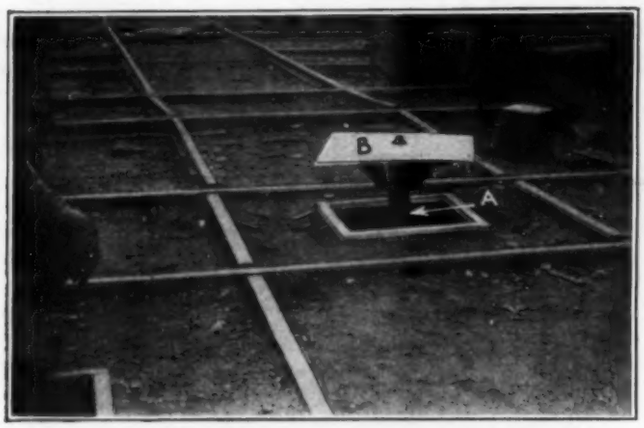


FIG. 5—AIR JACK THAT TAKES THE PLACE OF A TURNTABLE

valve is left so that the cylinder of the jack is open to the air, consequently the plunger must seek its lowest position and cannot then interfere with any

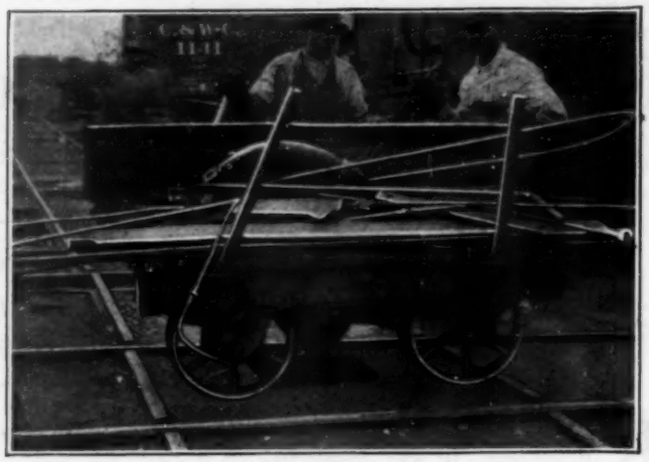


FIG. 6—INDUSTRIAL CAR LIFTED FOR TURNING

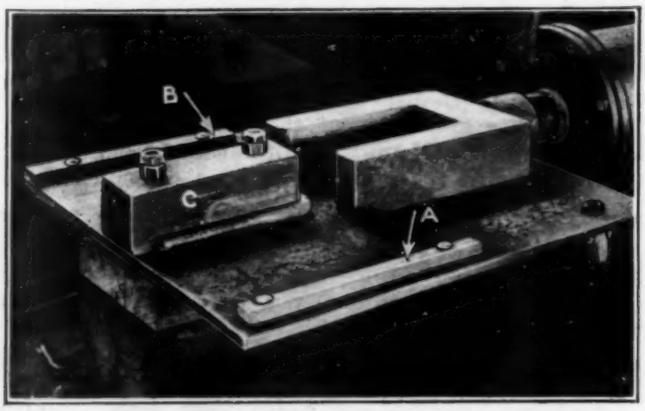
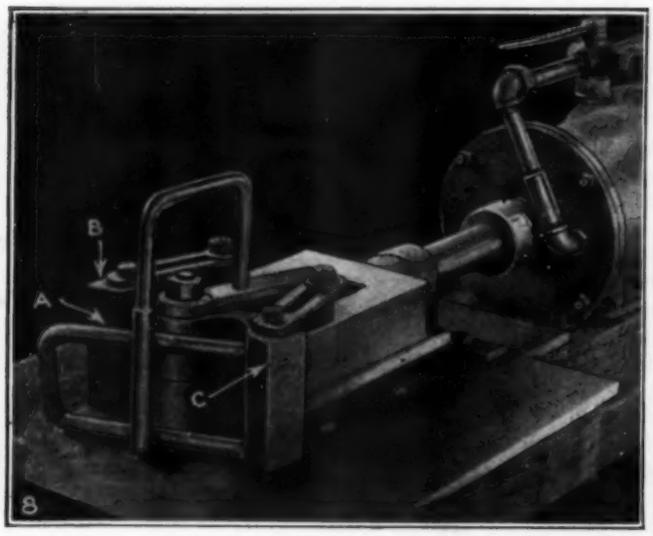


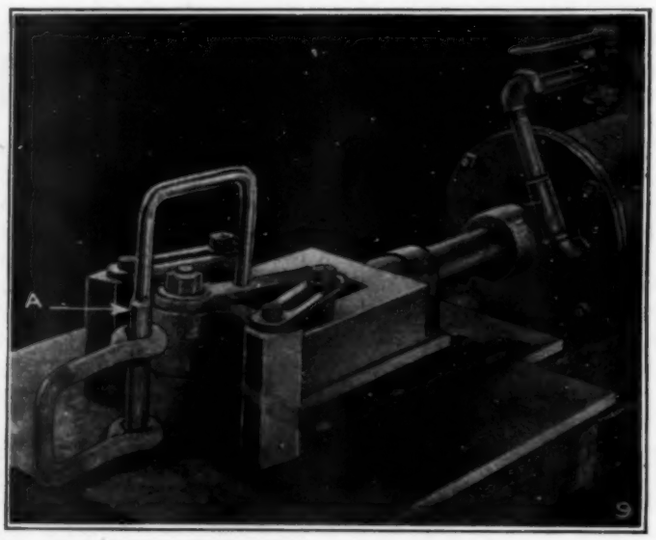
FIG. 7—MAKING THE FIRST BEND IN A BRAKE HANGER

equipment passing over the rails between which it is located.

By referring to Fig. 5, it will be noticed that the jack plunger carries a plate at *B*. This plate acts as a cover to the pit when the plunger is down and prevents it from being filled with dirt or cinders.

In the lower left-hand corner of Fig. 5 can be seen the pit in which the controlling valve is placed. In raising, turning and lowering the cars it is, of course,

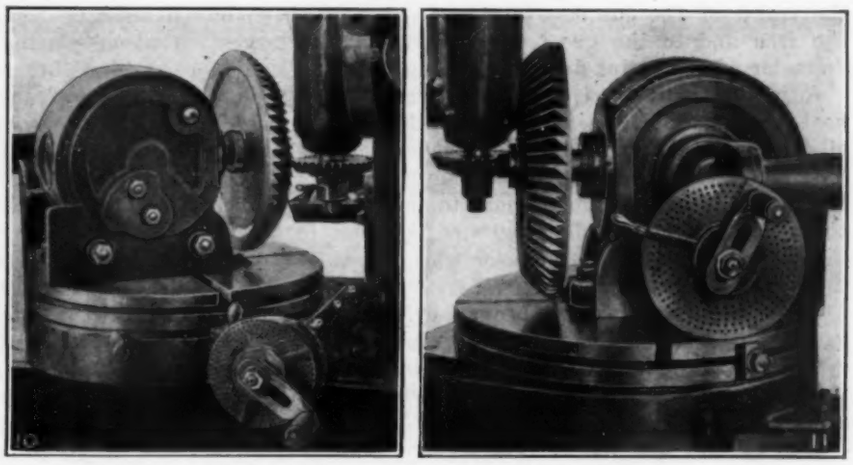




FIGS. 8 AND 9—BENDING THE EYES IN A BRAKE HANGER

necessary for the laborers to steady them somewhat as both the cars and their loads are always more or less out of balance.

The blacksmith shop is equipped with some air-operated devices that do credit to the ingenuity of their devisers. The machines for bending brake hangers, and shown in Figs. 7, 8 and 9, are typical examples of the devices referred to. All the bending is done hot and after a bar of the proper size and length has been heated it is placed between the guides *A* and *B* on the machines shown in Fig. 7. When air is admitted to the cylinder the ram moves forward and closes the ends of the rod around block *C*, bending it into an elongated U, as can be seen.



FIGS. 10 AND 11—MILLING THE TEETH IN A SPHERICAL CUTTER

The U-shaped bar is then re-heated and placed as at *A* in the machine shown in Fig. 8. As the ram moves forward the pivoted wings *B* and *C* close on it and bend it so as to form eyes at the ends of the U. Fig. 9 shows the result of the eye forming operation. The mandrel *A*, around which the eyes are formed can be lifted out of the machine, allowing the brake hanger to drop off. The two operations necessary to complete the bending of a brake hanger are done in a surprisingly short time.

FIG. 12—THE HEAT TREATING ROOM

The shop has a well-equipped toolroom in which some jobs are done in an unusual manner. Among such jobs is cutting the teeth in cutters used for machining spherical seats for steam pipes. The cutting face of the cutter is, of course, spherical in form and in order to have the lands of the teeth equal in width at all points, it is necessary to mill the spaces through an arc. If the spaces were milled straight across the face of the cutter, it would be necessary to do a great amount of filing after the milling was completed. It is true that the spaces between the teeth could be milled to the approximate contour of the face by making several settings of the work at different angles, but this would take considerable time and would only eliminate part of the filing.

In doing the job, as shown in Figs. 10 and 11, the cutter and dividing head were mounted on the rotary table of the machine in such position that revolving the table would feed the cutter to be milled, past the milling cutter in an arc whose radius was almost but not quite equal to that of the face contour. The difference between the radius of the cutter face and that of the arc in which the cutter was swung in milling was only sufficient to take care of the divergence in

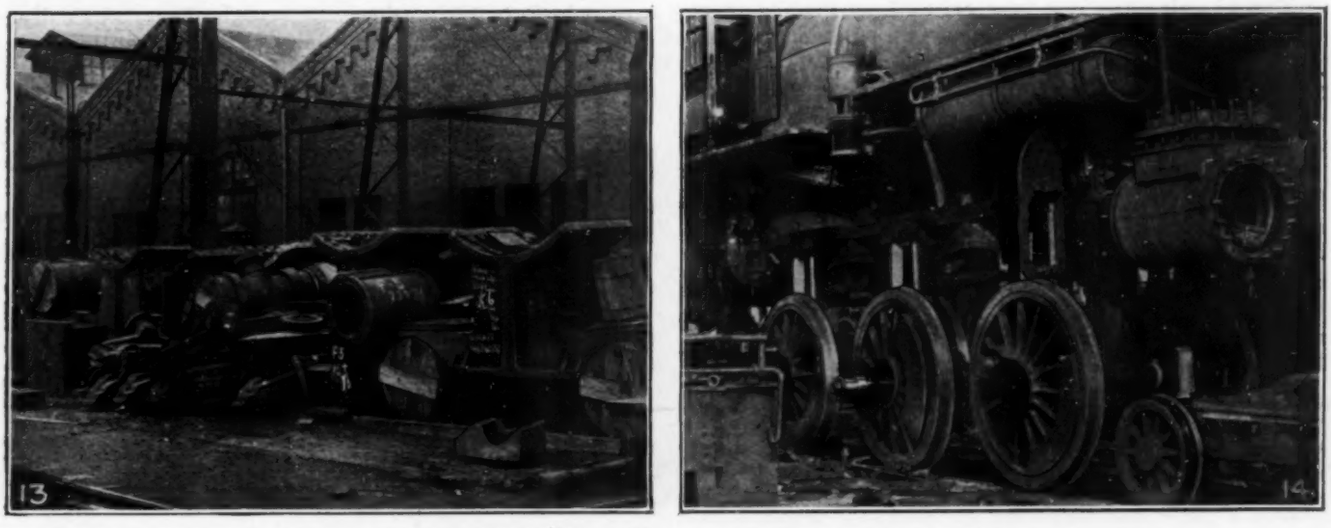


FIG. 13—SPARE CYLINDERS. FIG. 14—"WHEELING" A LOCOMOTIVE

the width of the cut due to the circular direction of the feed and to the greater movement at the largest diameter of the cutter during indexing.

Adjacent to the toolroom is the small but complete heat treating department for tools, Fig. 12, in which all tool dressing, hardening and tempering can be done without having recourse to the smith shop. By the location of this department next to the toolroom much time is saved that would otherwise be spent in traveling to and from the tool dresser who is usually located in the blacksmith shop.

When locomotives have broken cylinders the delay caused in replacing them is great, especially when new cylinders have to be ordered from the builders. In order to avoid such delays, a stock of new cylinders is carried, some of which are shown in Fig. 13.

One of the last major assembling operations on a locomotive after it has undergone general repairs is that of placing it on its wheels or "wheeling it" as expressed in railroad parlance. The driving wheels with the pony truck are placed on an empty track in as near the proper positions as possible and the driving boxes are put in place on the axles. Then the engine, with the shoes and wedges in place, is lifted from its blocking by the cranes and carried to the track on which are the wheels. As the engine is lowered, the driving boxes are guided into the jaws of the frame. It is often necessary to stop and start the lowering several times to bring all parts into position so that the jaws will meet the driving boxes fairly.

The operation of "wheeling" is shown in Fig. 14. After the engine is on its wheels the wedges are set up and the final assembling takes place. One of the last things to be done is to set the valves.

Autogenous Welding in the Petroleum Industry

By K. V. King
Metallurgist, Standard Oil Company of California

AUTOGENOUS welding has become a necessity to the petroleum industry. Welding has reached its present value in practically every branch of the oil industry only through a long period of development in which step by step it has been found and proven to offer a means of construction which usually results in greater economy, which enables the construction of equipment that often-times could not otherwise be built and which above all gives increased safety of operation.

In discussing welding practice, the first consideration should be the welders themselves. One of the principal objections raised against fusion welding processes is that the quality of the welds depends largely upon the ability of the welder. We recognize this fact, and have tried to meet it by the selection and instruction of the welders and by continual watch over the work. When hiring welders from the outside, we assume that they know their trade, but give each one a test or tryout to see if he meets our standard. This tryout consists of making V-welds in ⅜- or ¾-in. plate lying flat and vertical, and in welding 6-in. pipe held stationary, thus requiring overhead welding. This test is not severe, but is sufficient for our foremen to judge the applicant's ability. During the last year only 40 per cent of those who tried out have met our standard. When first employed, the men are placed on welding that is not subjected to high pressure or high temperature. Those who demonstrate sufficient ability are then placed on high-pressure work.

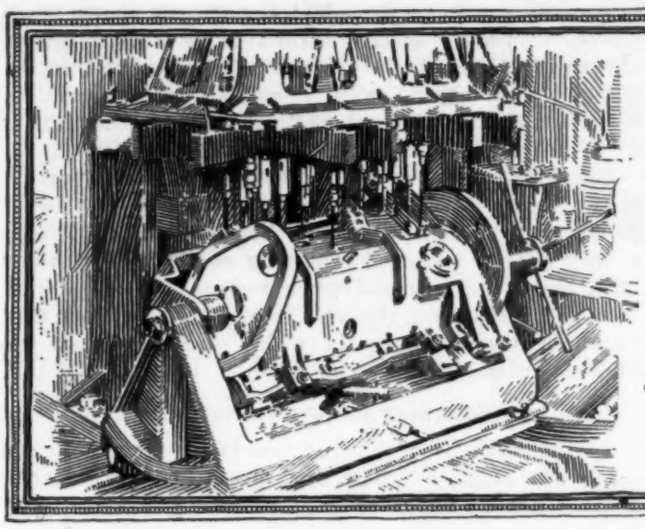
The material to be used in welded construction should be the next consideration. It is very desirable to use low-carbon steel, since it is not as susceptible to overheating, burning or oxidation and there is not the sudden difference in physical properties between the weld and the plate. It is well to make a distinction here between overheating and burning. A weld or any steel which has been overheated will have a coarse grain structure and be somewhat brittle. It can be restored, however, to a satisfactory condition by heat-treatment. On the other hand, metal that is burnt cannot be restored by any heat-treatment or mechanical work. This is true because there has been an actual formation of scale or oxide around the crystal boundries of burnt steel. In addition to being low in carbon, the steel should be low in impurities. A thorough investigation is under way covering the use of alloy steels in vessels, particularly when subjected to high temperature.

The ripple weld is used on steel plate under ¼ in. thick. For material heavier than ¼ in., particularly when subjected to high pressure and temperature, we hammer the weld while the temperature of the metal is within the critical range. Since the weld is originally a cast structure, hammering, which is in the nature of a forging operation, produces a finer grained structure and a metal that is more resistent to vibratory loading. Care is taken to stop the hammering at a temperature where the color is about a cherry red, for below this temperature it does no good and may cause injury by setting up cold strains in the metal. Particular care should be taken to avoid setting up cold strains in metal that is to be subjected to operating temperatures above 800 deg. F., as grain growth may result.

It is our practice to anneal all acetylene welds. There is a question as to the necessity of doing this, raised particularly by some of those doing commercial work. There seems to be no doubt, however, as to its desirability. Our attitude is that we want the best construction we know how to obtain. Considerable experimental work on various methods of annealing has been done. Small portable furnaces heated by oil torch, to encircle a weld in 6- to 12-in. pipe have been built, but difficulty was experienced in maintaining a lining. The method now used is to reheat the weld with the acetylene torch, using a large flame.

When annealing with the torch, the weld and the metal adjoining are heated to a temperature of probably a little over 1,600 deg. F., or a salmon color, and allowed to cool slowly. This is done for the purpose of relieving the welding strain, of annealing the weld metal to reduce the grain size and make it more ductile, and of removing any coarseness of grain in the base metal adjoining the weld. It is realized that the annealing temperature of the deposited metal is higher than that of the base metal, but it is thought that the beneficial effects of refining the deposited metal are greater than the harm that might result from the possibility of overheating the base metal. It has been found that annealed welds consistently show greater elongation over the welded area when tested, and they may be bent through a greater angle than when unannealed.

From a paper read before the San Francisco Section of the American Welding Society.



Tool Engineering

By
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Last article on design of dies—Miscellaneous dies for operations such as swaging and embossing—Riveting and tube forming in a punch press

IN OUR preceding articles the principles involved in ordinary types of dies have been taken up, and we have also given a number of actual examples showing applications of the principles mentioned. Our aim has been in all this work, to endeavor to bring out the principles on which the science of die design is based, for the reason that the designer who understands these principles has a foundation on which can be built a broader knowledge of special developments along the lines which have been indicated. It is not to be expected that a designer who is totally unfamiliar with die design can use these examples and principles and immediately become an expert die designer; but on the other hand the knowledge gained by careful study of the diagrams given will open up the field of endeavor and furnish the student with a sound foundation, so that his designs will be developed in accordance with the best modern practice and he will have obtained a very thorough understanding of the functions and operation of dies used for blanking, forming, piercing and drawing.

Die work covers a broad field, and there are many dies which cannot be classified as belonging absolutely to a certain type. These dies have not been discussed nor illustrated due to the difficulty of classification. There are many cases when a certain operation is performed on a punch press, the tools for which may be given a special name on account of their application to a given product. If we consider all of these applications as representative of various types, then there are probably more distinct classes of dies than there are of any other production tools used.

Various Applications of Punch Press

Considered as a factor in production, the punch press is very widely used for many minor operations. The machine itself is very simple in design and lends itself to many operations which require a quick blow or stroke to prepare a piece of work for a subsequent machining operation, or to force one part into another, such as a bushing into a bearing, or to some other similar mechanical operation which might ordinarily be done by hand or on an arbor press. Many times the use of a simple fixture or locating jig in connection with the punch press proves economical when assembling various units, and there are so many opportunities for development along these lines that we can do no more than mention the matter in a general way and illustrate it by a few simple examples. An examination of these examples will show graphically a few of the simpler applications which can be made. The punch press can often be utilized to advantage to perform such operations as broaching, riveting and assembling.

In Fig. 513 is shown the application of a punch press to a centering operation on the work at *A*. Ordinarily, a piece of work of this kind would be centered on a drill press or a centering machine and the operation,

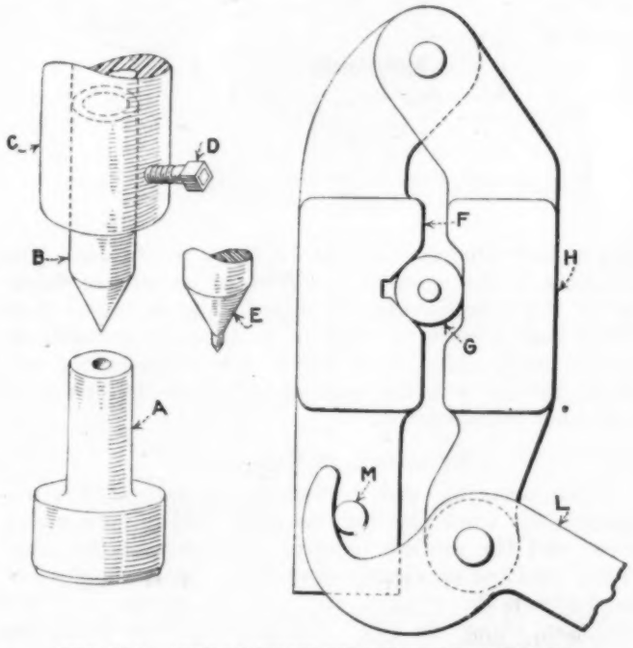


FIG. 513—APPLICATION OF CENTERING RIG TO PUNCH PRESS

while comparatively rapid, would be much slower than if done by a single stroke of the press. In the example given here the work is a forging, and the centering tool *B* is ground to the desired form and forced into the work by a stroke of the press. Naturally the metal is forced out and must go somewhere, but it does no par-

ticular harm as the enlarged portion is turned off in a subsequent operation.

The tool shown at *B* is held in a holder *C* and located permanently by the setscrew *D*. In some cases it may be well to use a backing-up screw behind the punch in order to give additional stability, depending largely upon the size of the work which is being centered. If it is required to center the end of the work and obtain a result similar to that obtained by using a combination center drill and reamer, the tool can be made as shown at *E*.

There are many ways in which the work can be held for this operation, but some method employing a V-block suitably fastened down to the bolster plate of the punch press by means of screws is generally used. The member *H* is a swinging clamp operated by the lever *L* which acts against the pin *M*, thus clamping the work *G* securely. This arrangement provides a very quick-acting device for locating work. It may be found advisable to use a heavy construction or an angle plate to back up the member *F* in order to resist the pressure of the tool when it enters the work.

An operation of this sort has been found successful

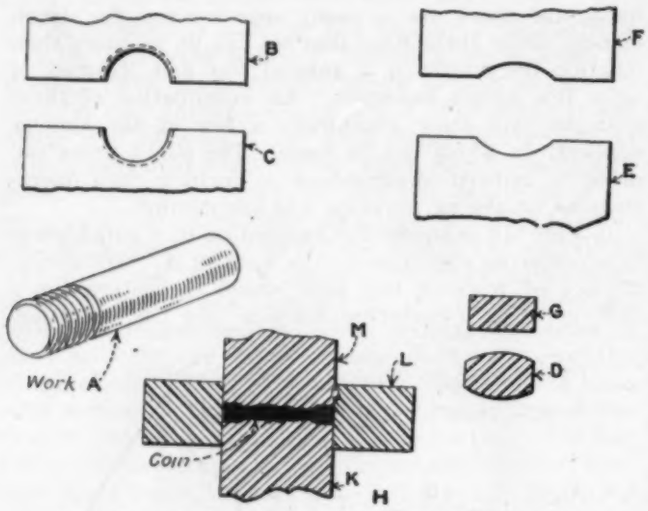


FIG. 514—EXAMPLES OF SWAGING OPERATIONS ON PUNCH PRESS

and considerable expense can be saved by its use. The accuracy of the work to be machined on centers determines the practicability of this device, as it has been found that a limit of 0.001 in. is about as accurate as can be held. The punch which forms the center will stand up for a great number of pieces before it is necessary to regrind it.

Swaging and Embossing

When swaging and embossing operations are required, this work also may be done readily on a punch press and the process involves a number of the principles we have previously described. Many shapes can be successfully swaged on a punch press, and the examples shown in Fig. 514 illustrate the principles clearly. The work shown at *A* is a shaft ¼ in. in diameter and made of soft steel. On it a thread is to be cut at one end as indicated. The requirements of this piece are such that a particularly accurate job is not required, and the limits are broad enough so that the operation can be successfully done by squeezing or hammering the stock together between the two dies *B* and *C*. The work is laid on the lower die and is struck with sufficient force to indent the thread almost completely around the piece. After this the work is turned through 90 deg. and struck again, thus completing the thread. This may be called a "cold swaging" operation, and the material used will naturally determine whether a thread can be successfully obtained.

Another swaging operation is shown at *D*, the portion shown being a section through a bar which is to be produced from another section like that at *G*. This is a very simple operation requiring only the dies shown at *E* and *F*. The metal when swaged by dies of this sort will easily take the oval form, although there may be slight variations in the width of the stock if the material used does not run uniform in size.

Construction of Coining Dies

In the production of coins two types of presses are used, one being a board drop press and the other a special toggle embossing press by means of which very heavy pressures can be obtained as the toggle straightens out at the end of the stroke. The process of coining is greatly different in principle from the other operations which have been described, as the metal is usually quite thick and is forced into the die by very heavy pressure, which practically makes the metal flow in all directions.

Work of this kind must be pressed slowly in order to give the metal time to flow, as otherwise the impressions will not be clear and sharp. The toggle embossing press used for coining handles the metal cold, as a general thing; but there are occasional cases when materials such as paper or cloth are to be forced into form when the material may be pressed while damp in dies, which heat it and which are therefore slow in their action in order to give the material time to dry during the operation. The upper and lower dies used to produce coins are often entirely different, and the metal is squeezed between the two so as to form the design required.

The principles involved in the use of coining dies are clearly shown in the example at *H*. Here a piece of metal is placed in the lower die *K*, which is surrounded by a collar *L* which acts as a retainer and prevents the metal from flowing too far out. In other words, it controls the diameter of the piece and also its shape. The upper die *M* is forced down on the metal billet, thus squeezing it between the upper and lower dies, by means of which the desired impression is obtained. The designer is seldom called upon to lay out a coining die, although the description given here is sufficient to show the principles involved.

Need of Heavy Construction

It is of great importance that the collar or ring *L* be made heavy enough to withstand the very heavy pressure to which it is subjected by the outward flow of the metal. A rule which is often used for determining the diameter of this ring is to make it at least four times the diameter of the coin, and of a thickness equal to the diameter of the coin. A ring of this sort, therefore, for a coin 1 in. in diameter would need to be not less than 4 in. in diameter and 1 in. thick. As the hole in the ring controls the size of the coin produced, it should be very carefully made, being hardened, ground and lapped to a smooth finish.

In Fig. 515 is illustrated in detail a swaging operation on a piece of work which many would consider a difficult job for a punch press. The work shown at *A*

is irregular in shape, and many times the hub *B* shown on it would be produced as a separate piece and afterwards riveted or otherwise fastened to the portion *A*. It is not always necessary to do this, however, as it is possible to swage a hub with sharp corners on it by using dies of special construction. The first operation consists of blanking the work to the form shown at *C*, and in this operation the hole *D* is also made of suitable size. A certain amount of stock must also be left

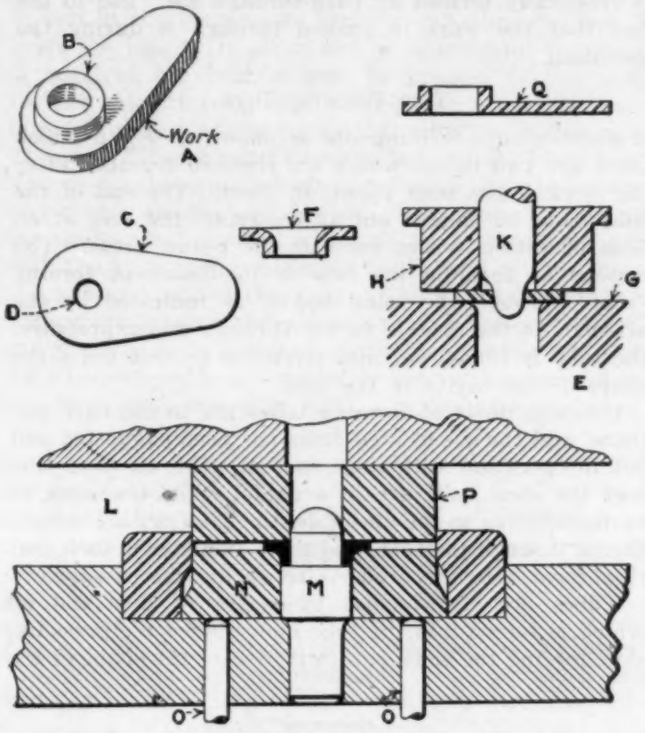


FIG. 515—EXAMPLES OF DIE USED FOR SWAGING OPERATION

on the contour of the blank for a final trimming operation.

The next operation, which consists of forming the work, is shown at *E*. In these dies the blank is drawn into the shape shown at *F*. The blank is located on the die *G* and is gripped and held by a pressure ring *H* as the ram of the press descends. The punch *K* continues down through the work and draws a hub on it, although it will be noted that there is a radius on both inside and outside portions of the raised section. The nature of the work requires that these parts be made without a radius, and the swaging operation is performed by using the dies shown at *L*. The work, which is indicated by the heavy lines, is located over the stud *M* and rests upon the spring pad *N*. Pressure is applied to this pad by means of the pressure pin *O*, which is forced upward by springs under the bolster plate. The swaging ring *P* comes down and exerts sufficient pressure so that the round corners are forced inward, the metal thus being compressed and obliged to take the shape as controlled by the various corners of the die. In this operation the principle used is to form the work to such a shape that a subsequent striking operation will swage it into the desired shape as shown at *Q*. The spring pad not only forms the work on the lower portion, but also acts as an ejector in the event that the blank has a tendency to stick on the locating plug *M*. It can be seen that the formation of the part becomes relatively simple when this method of procedure is used, and that considerable speed of production is possible.

There are many other varieties of work which call for a swaging operation, and a similar principle can be used for them when the occasion requires. There may be cases when there is no hole in the work, and a solution of problems of this sort can usually be obtained by applying the principles used in embossing or coining operations.

Use of Punch Press for Assembling

The use of the punch press for assembling various units of work has been proven very successful, and its economy over other methods is evident for the reason that the operations are usually more rapid and therefore cheaper. Such work as riveting two pieces together when they are held in place by a number of rivets can easily be done in a single operation by the use of dies, and at one stroke of the punch press. Fig. 516 shows an example of this kind in which the two pieces of work *A* and *B* are to be fastened together by means of four rivets *C*, only two of which are shown in the illustration. The two parts *A* and *B* are assembled so that the holes line up with each other and the rivets are placed in the work, after which the assembly is placed on the die so that the rivet heads locate in the button dies shown at *D*. A central location for the work is obtained by means of the pointed locating stud *E*.

The punch-holder itself is provided with riveting

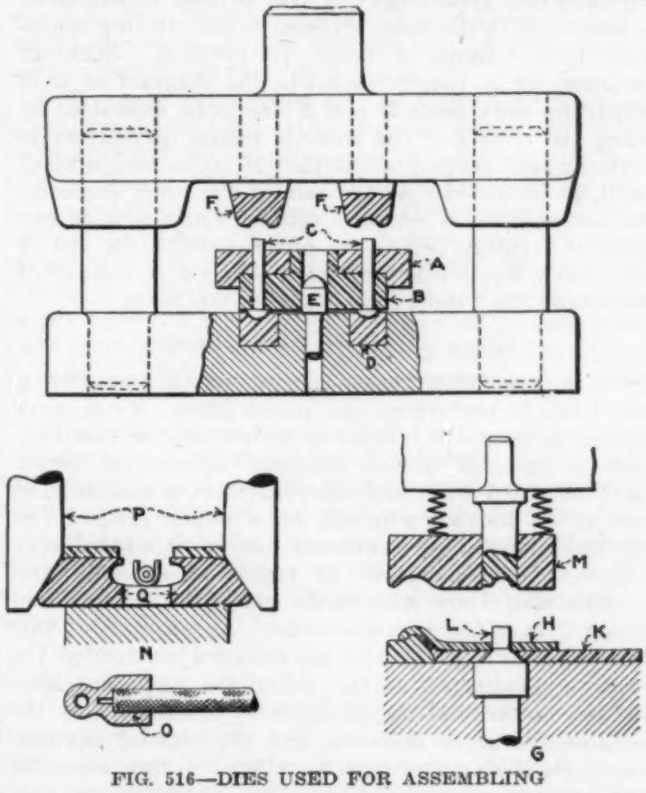


FIG. 516—DIES USED FOR ASSEMBLING

heads *F*, these being set so that they will be in position directly over the button dies *D*. As the ram comes down, the rivets are struck and formed at one stroke, thus completing the assembly of the parts and holding them together securely. This operation is very simple and can be performed rapidly. Care should always be taken in selecting the proper type of rivets, and in many cases it may be necessary to anneal them before attempting to head them over in a die of this kind. In

this illustration the die used is of the sub-press type, although it is not essential to use this variety, as a simple punch and die-shoe of the ordinary type will answer the purpose.

There are some cases where it is necessary to apply pressure to the work when the riveting is being done;

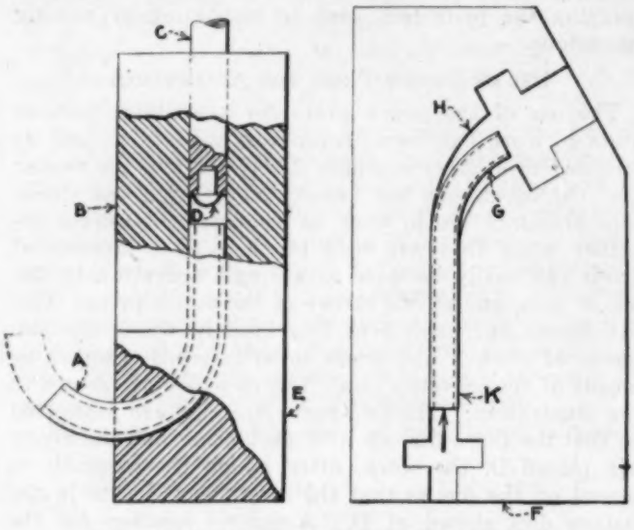


FIG. 517—DIE USED FOR FORMING TUBES

and it is often possible to provide a spring pad on the punch-holder, arranging this pad so that it will come in contact with the work previous to the riveting operation, thus holding it firmly in position. Such an arrangement is clearly shown in the diagram at *G* in which the work parts *H* and *K* are to be assembled by using the rivet *L*. The work is placed in position so that the bent portion of the part *H* hooks over a small anvil, as indicated. As the ram of the press descends, the spring plate *M* comes in contact with the work and grips it securely before the punch touches the end of the rivet. By this arrangement there is no danger of disturbing the relative positions of the parts.

Quick Assembling on a Press

There are many other operations in assembling which can be performed on a punch press. Metal boxes having corners which must be turned over so that they have a clamping action, terminal connections which have insulated wire, and other parts of a similar kind can all be handled properly on a punch press. The terminal connection mentioned can be assembled very rapidly and economically by means of specially constructed dies which close in the end of the terminal and clamp it over the insulated wire. An example of this kind is shown at *N*, and an enlarged section of the work is illustrated at *O*. After the work has been located in the die, the plungers *P* come down as the ram of the press descends and the angular portions cause the sliding dies *Q* to move inward, thus clamping the terminal over the wire. The insulation has previously been removed from the wire a suitable distance and the wire may be soldered to the terminal before this die is used.

Dies used for forming tubes to various shapes are somewhat special, and their nature is considerably different from any other that we have shown. When a tube is bent into curved form, it often buckles or flattens out on the turn so that it is not uniform either outside or inside. It can, however, be formed to size by using a method similar to that shown in Fig. 517. The tube *A* is placed in the upper portion of the die *B*, and the pin *C* which is provided with a pilot *D* forces the tube down through the die so that it passes through the forming section *E*. The action tends to make the tube conform to the shape of the die, and the metal is constrained to remain uniform in section. The view shows the work partially formed, and the general details of construction are clearly apparent. This form of die is frequently termed a "push-through die," due to the fact that the work is pushed through it during the operation.

Tube Forming Dies

Another tube-forming die is shown at *F*, in which there are two halves which are clamped together after the work *G* has been placed in them. The end of the tube is to be flanged out as shown by the dies at *H*. This operation is not done on the punch press. The method of forming the tube is by means of forcing "shot" through the small end *K* as indicated by the arrow. As the shot is forced through under pressure, the tube is forced out and stretched until it takes the shape of the cavity in the dies.

Other methods of forming tubes are in use here and there, and the use of steel balls has been suggested and put in operation with some success. For cases of this sort the steel balls are in a chute, while the work to be formed lies in the die below them. They are simply forced through the tube, and their diameter is such that they form it to the proper size during the passage.

Tubes are also formed by means of dies and oil which is forced into the tube under hydraulic pressure, thus forcing the work out until it takes the shape of the

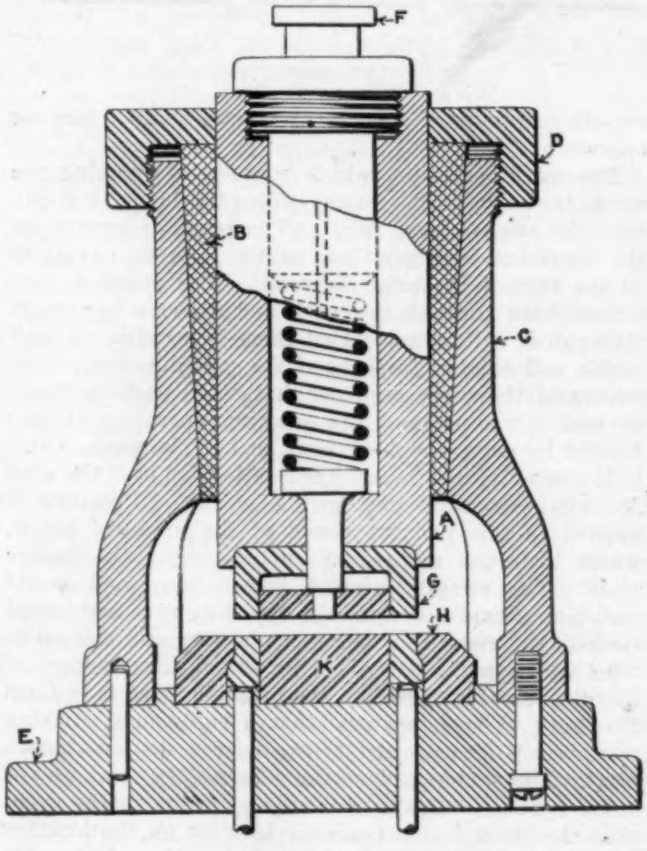


FIG. 518—BLANKING AND FORMING DIE OF CYLINDRICAL SUB-PRESS TYPE

die itself. When work of this kind is done, one end of the piece is often left closed so that the oil will have a surface against which it can act. It is a simple matter to cut off the end after the tube has been completely formed. Phonograph horns and other pieces of a similar kind are sometimes made in this manner.

A cylindrical sub-press die is shown in Fig. 518. This design differs somewhat from the ordinary type of sub-press die using pillars for location. It has a cylindrical plunger *A* which slides in a babbitt bearing *B* held in the housing or barrel *C*. A threaded nut *D* holds the babbitt in place, and as adjustment for wear is required the babbitt may be pressed further and further into its seat, thus maintaining a perfect bearing with proper alignment so that long life is obtained. The base *E* has a hub turned on it to fit the lower portion of the housing, which is fastened to it by means of suitable screws and dowels. The upper portion of the plunger is furnished with a button *F* which engages with the hook that is attached to the ram of the press.

A sub-press die of this type can be standardized when a great many small parts can be made of a similar size, and it can then be fitted with suitable punches and dies for whatever parts are needed in the cutting and forming of various pieces of work. In the example given herewith, a blanking and drawing die is assembled in the sub-press. The work is blanked by the punch *G* and die *H*, and it is formed over the block *K*.

The advantages of this die are that the recesses for the punch and die can be bored true to each other and kept concentric much more easily than in other form. Another advantage is the fact that the punch and die can be easily removed and replaced by a different set without in any way affecting the alignment. For work such as watch and clock wheels or other small parts of a similar kind, dies of this variety are capable of producing the parts complete with teeth, arms and necessary holes in one operation. They are often used in connection with blanking, piercing, bending, shaving, progressive or compound dies.

The information which has been given in this and previous articles on the design of dies should be sufficient to enable the designer to put into practice the principles illustrated. By applying thought to a given die problem a solution as to the proper method of procedure should be readily reached; after this has been done the rest becomes only a matter of detail work. Combining careful study with a knowledge of conditions will enable a progressive man to advance rapidly in the design of punches and dies for all varieties of work.

Uncle Bill Explains About "Overhead"

By John R. Godfrey

"YOU know, Godfrey," said Johnson, as we were philosophizing the other day, "I'm not much on this secret stuff in the shop. I wouldn't hire spotters in my shop if I had to quit tomorrow. Why, even old Jack Harper, who hires 'em once in a while, said they were the most unreliable birds he ever met. Always trying to find out what kind of a report you want—and then dig up evidence to suit.

"So, knowing how I feel, you may wonder how I got this," and he pointed to some typewritten sheets. "It's a verbatim report of a confab between little Jimmie Smith and Uncle Bill Bailey which will explain itself. I happened to be sitting beside that window next the shop yesterday noon and heard it start. So I gave Helen here the high sign and she took it down in shorthand. I wouldn't spy on 'em for a farm, but if you don't say it was worth while, I'll tear it up. Just listen good and proper while I read it to you.

" 'Say, Uncle Billy, what's all this stuff they call overhead?'

" 'Overhead, son—why overhead is what generally busts most mechanics who start in business—it busted me, all right, so I know.'

" 'Why, you're the best mechanic in the shop, Uncle Bill. I don't see why you shouldn't make a lot of money in your own shop. Tell me about it, will you? I'm trying to study about overhead in night school.'

" 'Being the best mechanic hasn't a darn thing to do with making money running a shop. Of course it helps get business, but the more business you do the more money you lose unless you are onto all the curves of that overhead you asked about.

" 'You see, son, there's a lot of things about running a business that the man in the shop don't think about. Can't think about them, of course, because he just naturally don't know anything about 'em. He ain't to blame, but he loses his hard-earned wad just the same when he starts in business for himself. And the trouble is he don't generally know just what hit him when the sheriff comes around and nails up his door.

" 'Now take this piston, son. Doesn't take much of a brain to know what the casting is worth. We both know that the labor cost is very low on these new machines. Jim and his gang, perhaps, total up to 10c. per piston for labor. Call the casting 15c. and we have 25c. material and labor. Seems like highway robbery when we see that the old man lists them at $2. That's what I thought when I started. I wanted only a *fair* profit on my work, so I put my price 'way down—and here I am back at work as a journeyman machinist.

The First Mistake

" 'You see, son, we forget a lot of costs just because they don't stand out and bat us in the eye every time we look at a piston. Let's just suppose we make them on a lathe and a drill press and that we buy both machines for a thousand dollars. Of course they're ours and most of us think that as long as we don't pay rent or interest we can just forget 'em. That's mistake number one—and a big one.

" 'If we had borrowed that money at 6 per cent it would cost us sixty dollars a year or five dollars a month just to keep 'em. If we had put that thousand dollars in the bank we'd get forty dollars a year, or sixty dollars in a safe mortgage. Manufacturing isn't as safe as a good mortgage and ought to command a higher interest. For easy figuring call it ten per cent or one hundred dollars a year.

" 'Then there's the rent of your shop and taxes, and believe me, the taxes count these days. Great and glorious victories cost real money when it's all over. Fire insurance and liability insurance for paying damages to your men have to be counted next. And these total up to a nice little sum. But they aren't the end by a long way.

" 'If you are running your own little shop you try to do all the clerical work. You order the material and chase it up over the phone or by mail or on your way to work. You open the mail and keep the accounts of money spent and received—when you don't forget it. And you're mighty apt to forget to put down a lot of things because your hands are greasy and you don't want to stop to wash up.

" 'In the beginning you also act as foreman even though you do run a machine whenever you get a chance. But you never charge up anything for management—nor count the time when you are not at work on the machines. When you've added up all these things you find that labor and material are a small part of the cost in making a piston.

NON-PRODUCTIVE HELP

" 'In our case this shop has grown beyond the one-man stage long ago. The old man has to have clerks to open and sort the mail, clerks to enter the orders and make out orders for the shop. The purchasing agent has to keep track of the materials we need and buy them at the best prices he can get. He also buys tools and machines and the like.

" 'Then there's the planning department which studies the best way of doing the jobs that come along and the foremen and the superintendents. If you imagine we could get along without them, just think of what a job it is to keep things running straight in one department, let alone the whole shop.

" 'Every time a letter or a postal comes into the office, somebody has to look it over. Perhaps it's only a kid asking for a catalog. Maybe it seems like a fool inquiry but it may develop into an order later. Perhaps it's someone raising very h—l because the shipping clerk didn't read the order right, left something out of the box, or maybe the customer himself made a mistake—they've been known to. Now, the old man can't look after all these, can't even answer 'em all. Has to have clerks and typewriters and dictaphones and filing cabinets and all that office junk you see. And somehow or other the girls and the boys in the office think they ought to be paid for what they do the same as we do. Of course we can kid ourselves that they ain't of much account and there's a lot of 'em ain't getting as much as you are son, but we have to have 'em and they have to eat, same as we do. And all that has to go onto the price of the pistons or motors or whatever. It's a part of overhead.

" 'Then there are the truckmen who get the stuff from the railroad and deliver the finished goods; the guys who keep track of the stock of bolts and nuts and things so we won't have to lay off the job; the telephone girl has to have money enough to keep her in gum and powder for her nose and perhaps a lip stick for Sundays and Wednesday evenings. And doggone it, son, they all think they earn real money.

" 'Once in a while, too, the old man gets a big order, and has to have money to pay for material and to keep us happy 'til the order is delivered and he can get his money. It runs into thousands and thousands of dollars and he has to borrow it from the bank and pay interest for the use of it. This and all the other things have to be paid for and the only way for the old man to get it is to tack the cost of these on top of labor and material.

" 'All these things go to make up overhead, son, and they make the original charges for cast-iron and for labor look pretty darned small sometimes. Of course some shops have too much overhead. The system may be too complicated and take too many clerks. That's where real management comes in, knowing how to get enough system without getting it top heavy.

" 'There's another thing I haven't mentioned either, son, and that is, while two dollars is the list price of that piston, the Johnson Motor Co. seldom gets the full two bucks. Dealers or repair men have to live, you know, so they buy 'em for perhaps one fifty or even one twenty-five. And even at that the old man would be tickled stiff if they would come with even a one dollar bill and take 'em away. But no, he has to send out salesmen to advertise in motor papers, to mail circulars, and spend real, hard money to sell enough to keep us busy. And if we are not busy, we're unhappy and the cost goes up, too, because all that overhead has to be charged up against fewer pistons.

" 'Gosh, son, it's most time to hear the whistle. Didn't know I'd gassed so long. But as I said before, I have painful recollections of what happens when you don't know all about tacking overhead onto your prices. Hope I've steered you a little in the right way, son. If not, come back at me tomorrow.'

" 'Uncle Bill, you've saved my life on that exam at tonight's class. I was plumb flustered as to how to answer the questions. But you've put the whole thing so it's plain and clear. I'll sure knock 'em cold on that exam.' "

Old man Johnson quit reading and looked up. "Ever hear anything better than that? I'll say you didn't. And to think Bill Bailey has learned all that since he fizzled a few years back. I'd like to broadcast it from every radio station in the country 'til everybody understood it. Guess I'd be satisfied to get it across to all my own men even. I'd like to make Uncle Bill sort of shop tutor, but the minute I did every mother's son of them would say I'd bought the old man to spill my side of the story and so it must be bunk.

"I'm not altogether blaming them, Godfrey, but if they just knew about this darn overhead stuff, as Jimmie called it, they'd be happier and things would go smoother. I'm wondering what else Uncle Bill has up his sleeve?"

And so I'm passing it on, because it seems so well worth while.

Bicycle Eliminations

The Fabricated Production Department of the Chamber of Commerce of the United States gives out the following story of elimination in the bicycle industry:

"We have had real co-operation from the bicycle industry, and the tire and rim group, and accomplished excellent results, and we have reduced the different models in the various bicycle factories by 22 models, up to the present time—that is, the collective amount—and while it is a slow process, using up the old materials, we are still getting somewhere all the time.

"We have a standard thread and tap arrangement for all pedals, which has been adopted by all manufacturers; we have a standard size for bicycle frames for men's and women's, each size being a separate unit, instead of as in the past when one model was made in four or five different sizes. Tires are standard size for 28- and 26-in. wheels; rims are standard for the tires, and we are now working on the saddle and handle bar people to standardize their product."

The Care of Tracings

By DWIGHT C. HOWARD

The value of tracings—How the table should be cleaned and covered—Keeping the cloth clean while tracing—Old tracings restored

IN A large proportion, the efforts made by the entire organization of all engineering offices find expression on tracing cloth. The forward progress of many of the arts, sciences and industries is primarily charted in this way. The final results of the patient toil of many men for days, weeks, months and even years in all the known fields of science and research are oftentimes reduced to a drawing or plan made on a few square feet of common tracing cloth. The results of highly trained experts in all the branches of scientific study and research finally arrive at consummation on a small sheet of tracing cloth, worth many thousands of dollars, when the completed plan is finished. Yet, the care of tracings is a subject that is not given sufficient attention in a large majority of engineering offices and drafting rooms.

IT IS FALSE ECONOMY to use a cheaper grade of tracing cloth, for it takes the draftsman more time to complete his work on a poor grade of cloth.

The table top should be cleaned and smoothed, and should be covered with paper a day in advance of the tracing.

A tracing that has been folded, badly jammed, cracked or crushed can be quite presentably restored by a thorough cleaning and by a careful burnishing treatment of the creases and cracks with powdered soapstone and a rightline pen handle.

The care of tracings begins first of all with the purchase of the roll of cloth. Frequently the cheaper grades of cloth are ordered with the idea of saving money. This is a great mistake and a glaring example of false economy. It takes the draftsman as much, if not more time to complete his work on a poor grade of cloth, as it does on the best. Only the very finest product should be allowed for tracings of important work.

Very often the draftsman is permitted no choice in the selection of the material with which he is to work. But whenever he is so fortunately situated that his ideas and suggestions are asked and considered, he is working against himself if he doesn't insist that the best grades be purchased.

Preparing the Table Top and Drawings

After the draftsman has been provided with the best grades of cloth, he should exercise great care in preparing the table and the drawing for tracing. He should see that the table top is perfectly smooth and absolutely free from all dirt and grit. Sometimes it is necessary to use a fine emery cloth to dress the wood wherever the fibers have become raised by thumbtacks. When the draftsman is sure that the table top is thoroughly clean and smooth, he should cover it carefully with a new sheet of detail paper, stretched on and fastened at close intervals along the margins with thumbtacks.

It is advisable to have these preparations completed a day or so in advance in order that the paper covering of the table will have had an opportunity for "finding itself" before the tracing is started. It is imperative that the paper cover should be flat and smooth, without wrinkles or bulges.

The draftsmen should carefully inspect the brown paper drawing he is to trace. The rough edges of the drawing should be trimmed, all the dirt and grime should be wiped from both sides, any holes made by thumbstacks should be burnished down smoothly with the wooden end of a rightline pen, and all unnecessary pencil markings and smears should be removed by erasure. The drawing should be fastened to the table with plenty of tacks spaced evenly around the margin.

In taking the cloth from the roll, allow an ample amount for the tracing itself and an excess margin for tacking and for trimming. Cut the cloth from the roll with library shears and remove the selvedge without wrinkling or straining the cloth. At all times, in handling the cloth avoid any bending within a small radius or crushing, as this breaks the starch coating that is applied to the linen in manufacture. This is an important precaution.

Tacking the Cloth Down

Cover the drawing to be traced with the cloth and tack the cloth down, starting first with the two diagonal corners. Exert a normal pull on the cloth between the corners, but do not strain. Tack the other two diagonal corners and then the sides. Smooth out the cloth from the center while tacking down the sides and use plenty of tacks evenly spaced around the margins. It is an advantage if this can be accomplished several hours in advance of the actual work upon the tracing, in order that the cloth may be allowed to stretch. The tacks should then all be removed and the cloth re-tacked.

Office rules and individual preference often govern the side of the cloth which is to be used for tracing. The glossy and the dull finished sides each require a different method of preparation. A mixture composed of equal parts of flour of pumice stone, powdered magnesia and fuller's earth rubbed lightly over the entire surface with a tuft of absorbent cotton will render the glossy side of the paper capable of taking the ink. If the work is to be done on the dull side, the use of the powdered magnesia is all the preparation necessary. Avoid the coarse, gritty preparations that are on the market and are often found in many drafting rooms. Most of these are decidedly injurious to the cloth and soon render the surface permanently rough, uneven and extremely susceptible to a grime that is difficult to remove.

Precautions To Be Observed While Tracing

Begin at the top of the tracing and work down the sheet, keeping as much of the tracing cloth as possible covered with tacked detail paper. The draftsman soon can accustom himself to working in a small area and to completing all the work in that space before continuing in another space. Make every effort to avoid scrubbing over the completed, inked lines with triangles or scales. From time to time, keep the surface free from grease, perspiration and grime by using the powdered magnesia and cotton tuft. In warm weather, keep the forearm and wrist free from perspiration by the use of talc or magnesia.

Endeavor to keep all tools, ink bottles, erasers and all other articles off the cloth. If you must have your tools on your work, glue billiard cloth, felt or chamois skin to the underside of a shallow cigar box and use this for a tool container. If you use an electric light on a metal stand, see that the base is protected by felt or some other material. Whenever the work is to be left for any length of time, cover it carefully with cloth or oilcloth that is itself clean. Preventatives for keeping the dirt from lodging on the tracing are preferable to much cleaning.

It is not advisable to use gasoline or naphtha at any time to clean the tracing cloth. Both of these agents have chemical properties that cause the tracings treated with them to become brittle, dull and yellowish, and sometimes to turn almost to a tan color. Rather than employ this method with such disastrous results, use extreme care in protecting the drawing from dirt. When at times dirt is unavoidable, art gum and erasers carefully used will remove any accumulation of grease and grime. After erasing, brush away all the débris and see that it does not creep under the edge of the tracing.

Tracings are often ruined or badly damaged when prints are being taken from them. Too often, inexperienced assistants are allowed to handle priceless tracings at this critical time. Many tracings which represent large outlays in time and money are returned to the table from the printing machine with ineradicable finger and water spots. These damages can all be avoided by using judgment in the selection of an operator who will appreciate the necessity for carefully handling tracings around the printing machine.

Tracings should be filed flat in trays or in vertical envelopes in metal cabinets. If the system in use does not permit this manner of filing and if the tracings must be rolled, dust them lightly on both sides with powdered soapstone, roll them carefully around a wooden or paper form, and wrap them in paper or oilcloth. Both ends of the tube so formed should be carefully protected. In filing this tube, do not allow any weight to rest on it in the cabinet. Where quantities of tracings are kept in vaults or in cabinets, a protected open vessel of water placed in the vault will prevent the excessively dry condition that is apt to prevail.

Restoring Old Drawings

It frequently happens that prints are required from, or additional detail must be inked in on very old, grimy tracings that have lain dust-laden and neglected for many months or years. To restore these old tracings to a usable condition presents no great problem, if a delicate treatment is given them.

Handle the tracings very easily at all stages of the operation. Tack them face down on the board at close intervals along the margin. Prepare in equal parts a mixture of finely grated red rubber eraser and art gum. The grating can be accomplished with a new machine file of medium grade. Spread the crumbs over the surface and rub them with a cotton or cheesecloth swab or with the palm of the hand. Work slowly and without undue pressure, replacing the dirt laden mixture with a fresh one from time to time. Use erasers on the specially grimy places. Be certain that the back of the tracing is clean and then continue the process on the face.

Avoid a direct pressure on the faint inked lines, and use eraser and shield if the surface is particularly smudgy. After the face of the tracing is as clean as possible, wipe it all over with a cheesecloth rag containing just a suspicion of three-in-one oil and expose the tracing to the strong direct sunlight for a few hours. When adding more inked work, dust the surface lightly with powdered magnesia and soapstone.

A tracing that has been folded, badly jammed, cracked or crushed can be quite presentably restored by a thorough cleaning as before described and by a careful burnishing treatment of the creases and cracks with powdered soapstone and a rightline pen handle.

All these methods for cleaning and restoration depend for their success upon the willingness of the draftsman to use extreme delicacy in manipulation, and plenty of time. It is far better to spend a little of this time in prevention by protecting valuable tracings from dust and dirt.

Manufacture of Models and Patterns, 1921

The Department of Commerce announces that, according to reports made to the Bureau of the Census, the value of products of establishments engaged primarily in the manufacture of models and patterns, not including paper patterns, amounted to $15,742,000 in 1921 as compared with $25,300,000 in 1919 and $8,605,000 in 1914, a decrease of 37.8 per cent from 1919 to 1921 but an increase of 83 per cent for the seven-year period 1914 to 1921.

In addition to the value of products of the establishments assigned to this classification, models and patterns to the value of $432,000 in 1921, $1,107,000 in 1919, and $351,000 in 1914 were reported as subsidiary products of establishments assigned to other classifications.

This classification covers the manufacture of wood and metal models and patterns of all kinds, including molds used in making machinery and castings, brick, glassware, rubber goods, etc., hat blocks, shoe patterns, wax figures, dress and show forms.

Industrial Cost Accounting for Executives

By PAUL M. ATKINS

The tenth article—Recording the value of material —Voucher register for stores purchased—Accounts to be operated for materials withdrawn

IN THE LAST article we saw the importance of the correct pricing of materials and investigated three different methods by means of which this end might be attained. In this article we shall consider the accounting records by means of which the financial inventories of the material may be maintained. In general, these accounting records are kept in the form of controlling ledger accounts. The first of these accounts to interest us is that for stores. For small or medium sized concerns one account is usually sufficient. For larger companies it is often wise to break the account up into several, as for instance, the raw stock account, purchased parts account, stationery account, miscellaneous and general stores account. Since all of these accounts should be operated in substantially the same manner, only one stores account will be discussed as an example.

The theory upon which this inventory account should be operated—as, in fact, all the other inventory accounts should be handled—is that if the materials acquired during the period are added to those on hand at the beginning of the period, and those issued during that same time are deducted, then the value remaining should be the value at cost of the material on hand. If any difference exists between a physical inventory and this balance, it is due to errors either in keeping the perpetual inventory or in taking the physical inventory, or else it is due to losses or pilfering of materials.

Let us assume as a starting point that a very careful and accurate inventory has been taken of the stores actually in the storeroom and that this inventory is set up as the opening entry of our stores account. Since the inventory is an asset, it will be a debit entry, of course. During the month which follows various purchases of materials are made which must be debited to the account. The means by which the debit is obtained is usually a special journal which is frequently called a "voucher register." As the book is used to record all kinds of purchases in addition to stores, it may be well to consider it somewhat in detail.

VOUCHER

Date	Voucher No	Name	When and how Paid		Accounts Payable Cr.	Stores Dr.	Freight In Cr.
			Date	Check No.			

REGISTER

A Expenses		S Expenses		M A. Expenses		M D Expenses		Miscellaneous Accounts			
Sym.	Dr.	Sym.	Dr.	Sym.	Dr	Sym.	Dr.	Name	L. F.	Dr	Cr.

FIG. 28—THE VOUCHER REGISTER JOURNAL

When a voucher register is used, it may be laid down as a general rule that no expenditures of any kind shall be made except those which are recorded therein. Hence the ruling of the book must provide for all contingencies. In Fig. 28 is shown a typical form for this book which is so arranged as to be adaptable to a wide range of industries. In the first three columns are to be entered the date of the voucher, its number and the name of the party from whom the purchase has been made. The voucher referred to and from which the book gets its name is simply a form to which the invoice or bill of the vendor is attached and which, when approved by the proper persons, authorizes the payment of the sum named thereon to the party indicated.

In the next two columns we find space for recording

For the author's forthcoming book. All rights reserved.

the payment when it is made. This record in substance is simply a reference to the checkbook in which the check paying the voucher is recorded. The total amount of the voucher is entered in the next column headed "accounts payable cr." The total of this column at the end of the month is credited to the controlling accounts payable account. The entry in this column and the subsequent postings are made whether or not cash is paid for the item in order, as was said above, to have all expenditures entered in this book. Under these circumstances the total cash disbursed will also be debited to this account.

The Expense and Miscellaneous Items

The various other columns which follow are for the distribution of the various kinds of expenditures in such a way as to facilitate their posting to the general ledger. The decision as to whether or not to have a column for a group of items will depend on how frequently these items appear. If they must be recorded at brief intervals so that there are a large number during a month, then it is usually wise to have a column especially for them. It is on this basis then that we have a column for stores, the purchases and receipts

Before leaving the subject of the voucher register, a few lines about the remaining columns may be in place. There is ordinarily one for the payroll and sometimes for other items in addition to those for expenses and miscellaneous items. There is almost always a variety of expenditures for different kinds of expenses. These expenses can be separated into four principal classes according to four main groups of expenses—administration, auxiliary manufacturing, direct manufacturing and selling. Inside of these groups will be many expense accounts which will be explained in detail in later articles, and hence it is necessary to keep the different expense account items separate. This separation is accomplished in a very simple fashion. The symbol of the individual expense account within the main group indicated is entered in the left-hand section of the column and the amount at the right. At the end of the mouth the total of the column should be debited to the controlling expense account in question. The details should be summarized at the foot of the column and thus made ready to be posted to the individual expense accounts in a manner which is discussed in a later article.

The next problem is to obtain the amount of stores

STORES JOURNAL

Date	Total	Mdse. in Process	W.M. in Process	Imp. in Process	A Expense	S Expense	MA. Expense	MD. Expense	Misc.

FIG. 29—THE STORES SECTION OF THE MATERIAL JOURNAL

of which are occurring almost every day. At the end of the month the total of this column is debited to the stores account in the general ledger.

It will be noted that immediately to the right of the column for stores is a column headed "freight in cr." This column is to provide for those conditions mentioned in the previous article when it is desirable to add the cost of transportation to the plant to the purchase cost of the materials. The estimated freight in should be noted as a memorandum on the voucher and entered in this column. At the end of the month the total should be debited to the stores account and credited to the freight in account in the general ledger. The actual cost of the freight in will, of course, be debited to the latter account, and any difference between the actual and estimated transportation cost can either be treated as an expense or else be carried to profit and loss directly.

If all of the materials come in by freight, there is not likely to be any very large difference between the actual and estimated transportation charges. It not infrequently happens, however, that it is necessary to ship by express in order to save time. Under such circumstances, it is hardly justifiable to add the cost of the expressage instead of the cost of the freight to the value of the stores. The difference does not indicate any enhanced value of the goods but marks, rather, the cost of a failure to control the purchase of the materials or the operation of the factory in a wholly satisfactory fashion. Hence, only the freight rate should be used in estimating the cost of freight in and the discrepancy which results should be taken care of in the manner indicated.

withdrawn during the month. One method, mentioned in the preceding article, is to find out how much is left and to treat the difference as the amount issued. It is quite impossible for most concerns to take a physical inventory monthly, but it is possible to take an inventory of the balance cards. If the second method described in the preceding article is used, it is simply necessary to total the value shown on the cards to obtain the balance. If either of the other two methods is employed it will be necessary to make some additional calculations. In any event, however, it is not very desirable to take an inventory in this manner. It means that the clerks who operate these cards must work overtime at the beginning of the month and allow their current work to get behind or else additional clerks must be employed for the purpose. In the latter case, the two sets of clerks would get in each other's way and a slowing up would result and often inaccurate postings. In addition, this method does not provide any check on the inventory and it is practically impossible to use the results attained as a means of verifying the material distribution for the month.

The Use of Material Journal

A much simpler and more satisfactory way is to make use of what is often called a "material journal." This journal is commonly divided into several parts, some of which are mentioned in other connections later. The stores section of this journal is shown in Fig. 29. There is first a column for the dates, then one for totals with distribution columns extending to the right for the controlling accounts to which material may be charged, and a miscellaneous column for other items.

The operation of the method is very simple. When the issues and credit slips have come to the cost department from the balance desk they should be extended, if the second method described in the previous chapter is not employed at that desk. The slips should then be sorted according to the charge symbol which they bear, into the groups indicated in the illustration. Day by day the groups should be totaled and a grand total obtained. The grand total ought to be entered daily in the total column and the other totals placed under their proper heading. The credit slips should be totaled separately and entered in red on a separate line in order to facilitate checking the distribution of the material to the various orders. This method will be explained in a later article dealing with order costs. At the end of the month the several columns must be summed up and the net totals entered at the foot of each. The total of the total column is then posted as a credit entry of the stores account since it represents the value of the stores withdrawn during the month. When the posting has been done, the stores account will appear much as follows:

STORES ACCOUNT

Inventory (to open account)	Stores journal (value of all stores withdrawn from the storeroom during the month. Debits therefore to work in process, expense and miscellaneous accounts.)
Voucher register (value of stores purchased during the month. Credit therefore to accounts payable account.)	
Voucher register (estimated cost of transportation in on material purchased during the month. Credit therefor to the freight in account.)	

(There is always a debit balance to this account which represents the value at cost of the stores remaining in the storeroom at the close of the period.)

Our next concern is the worked material. What has been said about inventories in general applies as well to the worked material account as to the stores account. Let us assume, as before, that we get our initial worked material inventory by taking a very careful physical inventory. The next problem is to find out the debit to the account for worked material completed during the month and turned into the storeroom. Evidently since the material is made in the plant it will not be possible to obtain such information from the voucher register. The source of the information is ordinarily another section of the material journal called the "worked material in journal."

Operation of Worked Material Account

In the preceding article, it was pointed out that when the worked material is finished and turned into the storeroom it is recorded on a worked material in slip and that this slip, when it is entered on the balance card, is priced with an estimated price which is usually the actual cost price for the preceding month. These slips are then sent to the cost department and extended, often sorted according to the kind of worked material if there is more than one class and totaled day by day. The totals are then entered in the worked material in journal which is illustrated in Fig. 30, and at the end of the month the columns are summed up. The total of the total column is then posted as a debit to the worked material account and also as a credit to the worked material in process account, an account which will be discussed in a later paragraph.

The credit to the worked material account is obtained from a worked material journal which is ruled and operated in the same way as the stores journal. When this posting is done we find that the worked material account appears substantially as follows:

WORKED MATERIAL ACCOUNT

Inventory (to open the account.)	Worked material journal (value of all worked material withdrawn during the period. Debit therefore to in process, expense and miscellaneous accounts.)
Worked material in journal (value at estimated price of worked material completed during the period. Credit therefore to the worked material in process account.)	

(There is always a debit balance to this account which represents the value at estimated cost of the worked material remaining in the storeroom at the close of the period.)

The Worked Material in Process

Our next consideration is the worked material in process account which, it was pointed out, was the source of the debits to the worked material account. The worked material in process account is the record

WORKED MATERIAL IN JOURNAL

Date	Total	M. D. A.	M. D. B.	M. D. C.

FIG. 30—THE WORKED MATERIAL IN SECTION OF THE MATERIAL JOURNAL

of the value of the worked material which is in the process of fabrication in the shops. It is probably the hardest of all the inventory accounts to maintain and many concerns do not even make any effort to solve the problem which it presents. It is practically impossible to take a real physical inventory of goods in process whether of worked material or merchandise. It is very difficult to say at any moment at just what state of completion the goods are and unless correct cost records are maintained it is equally impossible to say what the goods have cost to that point. If satisfactory cost accounts are maintained, there is no need of taking such a physical inventory, and so we see that under practically all circumstances there is nothing of real worth to be gained by so doing.

Handling the Inventory Problem

The proper way to handle such an inventory is to keep a careful record of the costs of each order while it is being worked upon and to deduct this value from the in process account when the order is completed. If we will turn back to the third and fourth articles we will remember that the cost of goods produced in the factory is made up of the direct material, the labor and charges cost and the earned burden. We find, then, that the worked material in process account is debited with stores, worked material (for worked material *parts* are often used to make worked material *sub-assemblies*), direct labor, direct charges, and earned burden. The credit is obtained, as was previously noted, from the worked material in journal. We find

that the account will appear in substance as follows:

WORKED MATERIAL IN PROCESS ACCOUNT

Stores journal (value of stores issued to worked material orders during the period. Credit therefore to the stores account.)

Worked material journal (value of worked material issued to worked material orders during the period. Credit therefore to the worked material account.)

Payroll book (value of labor directly expended on worked material orders during the period. Credit therefore to payroll account.)

Voucher register (value of direct charges chargeable to worked material orders during the period. Credit therefore to accounts payable account.)

Burden journal (value of earned burden assignable to worked material orders during this period. Credit therefore to manufacturing burden account.)

Worked material in journal (value at estimated cost price of worked material completed during the period. Debit therefore to the worked material account.)

General journal (amount of variation between the actual and estimated cost of completed worked material. Debit therefore to worked material variation account.)

NOTE: If the difference is an excess of the estimated over the actual cost, then this entry will be a *debit* to this account and a credit to the variation account.

(There is always a debit balance to this account which represents the value at actual cost of the worked material remaining in process at the end of the period.)

Another point which needs a little further discussion, though its handling is indicated in the schematic account above, is the problem which is raised by the fact that the account is charged with the actual cost of making and is credited at an estimated cost. When the order is finally completed and the worked material in slip is filed with the order to which it belongs, it is then possible to compare the actual cost with the estimated cost and to ascertain the difference between the two. These differences should be totaled at the end of the month, care being taken to note whether the actual or estimated cost is in excess. A general journal entry is made out of the net total which is credited to the worked material in process account if the actual cost is in excess of the estimated cost, and is debited if the reverse is true. The corresponding entry is made in a worked material variation account which is usually left open till the end of the year and then closed in profit and loss or surplus. It usually is a small amount which so remains for the differences are likely to cancel each other to considerable extent over a period of time if the estimating is done carefully and intelligently.

Relation Between the Two Material Accounts

As in the case of the stores account so it is possible to split the worked material account and the worked material in process account into several divisions if it seems desirable. If one is divided then both must be arranged in the same fashion for it must not be forgotten that the credit to the worked material in process account is the debit to the worked material account. It will also be necessary to add additional columns to the material journals to care for this expansion and additional sheets to the worked material section. All sections of the account will be handled in the same manner and the discussion which has been recorded here will apply to all alike.

The records for merchandise will be practically the same as those for worked material if the merchandise is made for stock. If the merchandise is shipped as soon as made, then the credit to the merchandise in process account can be carried directly to the trading account as the cost of sales. In any case, it is practically always possible to use the actual cost of the completed merchandise instead of an estimated cost as the pressure of time is not so great.

This discussion of the accounting records for material should be kept clearly in mind as in many ways it is the backbone of the cost accounting system. Contacts with it and references to it will be constantly made in later articles, and often they will not be entirely clear if the ideas presented here have not been firmly grasped.

One Way of Getting New Machines

By Frank C. Hudson

Here are two stories, both of them true, which illustrate the difficulty railway shops have had to secure modern machine tools. I was being shown through a shop by a master mechanic who pointed out an old Sellers axle lathe of the vintage of the late 60s. It had a hollow round bed and was very substantially constructed in every way.

"That's been a good lathe in its day," said the M. M. "Not so bad now except it just naturally isn't so fast or as convenient as the newer lathes. Can't get a new one as long as that lasts. I've got a standing offer of $10, not official you understand, as a reward for any man who can break it in actual service. Couldn't explain a sledge hammer break very well. But the darned thing was built so strong we haven't been able to smash it yet."

Some recommendation for William Sellers, as a designer, but hard on the M.M. who needed a new axle lathe.

In the other case a friend of mine hired out as a boring mill hand in a railroad shop. He needed a job badly and jumped at a chance on a night shift, even though he was about dead for sleep. 'Twas a good sized old boring mill where a job, once set up, lasted for an hour or more. And Joe, quite unintentionally, succumbed to nature, and promptly went to sleep. The next he knew, the whole shop seemed to be falling apart. The tool had run down into the table and everything seemed to fall to pieces like the "one hoss shay." Joe woke up, saw what had happened, picked up his hat and coat, and skipped without leaving an address. He didn't ask for any pay either.

Some years afterward, in another part of the country, he hit another railroad shop for a job. After the M.M. had hired him he looked at his name again. "Joe Sharp"—sounds a bit familiar to me, but I don't just recall him. Fellow with a name something like that did me a good turn once. Hired out as a boring mill hand on the night gang. Went to sleep and busted the mill all to pieces. Got scared and lit out. If he'd only stayed I'd have raised his pay. I'd been trying to get that d—— mill busted for two years, so I could get a new one, and he helped me out."

"I'm the man," said Joe, "and I sure wish I'd known it, because I needed a job mighty bad just about then."

You can hardly expect efficient railway shop work when the executives have to resort to such drastic methods to get modern machinery.

Further Operations in Steam Shovel Work

By FRED H. COLVIN
Editor, *American Machinist*

Swiveling drilling fixture for track rollers—Fixture for squaring crank disks—Welding Stellite tips on tools—Storing fixtures—The "Marion Square"

ONE OF THE jobs in building steam shovels in the Marion Steam Shovel Works, Marion, Ohio, is the making of rollers for the creeper tracks used on some types of machines. These rollers are steel castings which have to be drilled only for the bearing on the pin. They are drilled under a Colburn heavy duty machine in the fixture shown in Fig. 1. The roller is clamped in place by the two straps *A* and *B*. The fixture revolves on a trunnion at *C* and is indexed by the pin at *D*, so that the roller can be drilled from each end, the drill being guided by the bushing at *E*.

Another part of a steam shovel is the small engine of the winch or hoisting type, which has a crank disk on each end of the shaft. Fig. 2 shows a fixture for squaring the disks on the shaft. The brackets *A* and *B* are mounted on a substantial bedplate and can be moved to any desired location according to the length of the shaft. The first disk is squared against the face of the bracket and the shaft forced into place, the key locating the disk with regard to the crank pin. The second disk is then placed in position and forced on the shaft until it squares against the other bracket. This makes a simple and effective method of squaring the two disks. The fixture can be adapted to numerous sizes of disks.

Babbitting of bearings for the engine crank- and other shafts is shown in Fig. 3. Fixtures are made which hold the mandrel central in the hole to be babbitted as shown at *A*. In this case the babbitting fixture is located by the pin *B*. A frame already babbitted is shown at *C*.

Trimming steel plates is no longer the laborious job it was before the days of the flame-cutting torch or burner. A torch is shown at work in Fig. 4, trimming the edge of a plate riveted to a large steel frame-casting. The cutting torch moves along on the light double track shown and, being so guided, cuts in a straight line rapidly and with little or no effort on the part of the operator.

Another use for the torch is in the welding of stellite tips on lathe, planer and boring-mill tools. Both the tip and the shank are prepared in the usual manner and are held in the proper position for welding by the small and easily made press shown in Fig. 5. This press is simply a substantial frame bent up from bar steel with two clamping screws at right angles. These screws hold

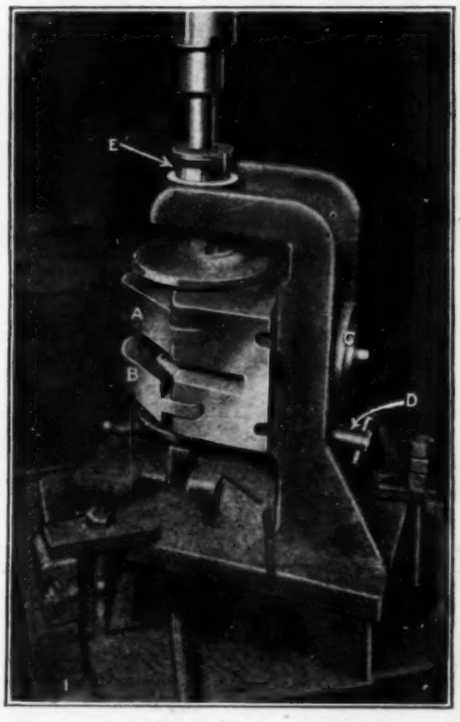


FIG. 1—DRILLING ROLLERS FOR CRAWLER.

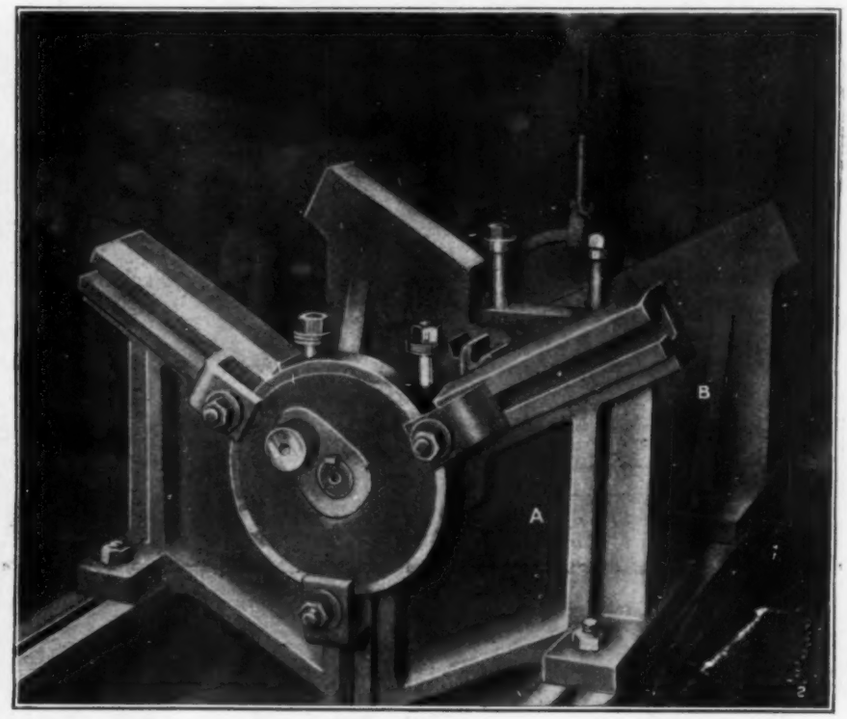


FIG. 2—SQUARING CRANK DISKS ON SHAFT

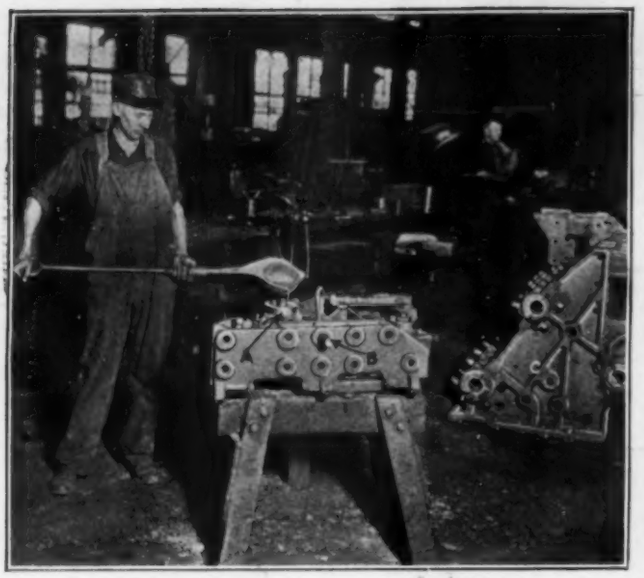
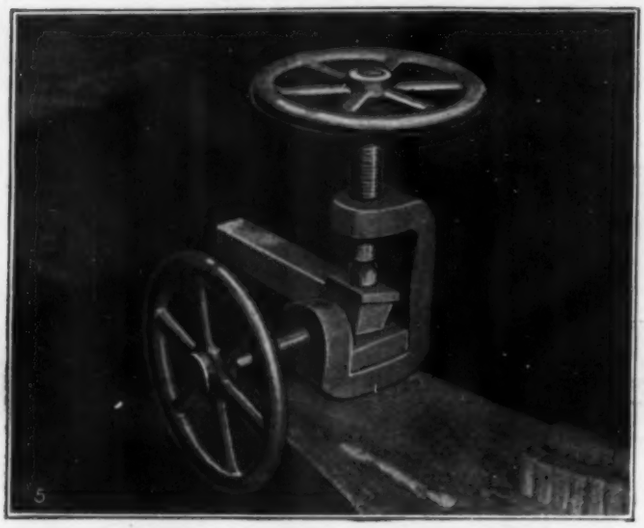


FIG. 3—BABBITTING ENGINE FRAMES

FIG. 4—FLAME CUTTING OF PLATES



the shank and the stellite tip firmly in position during the welding operation.

The storing of fixtures and parts is quite a problem in many shops. This shop solves it in two ways, depending on the sizes of the fixture. Comparatively small fixtures are stored in steel boxes having bails or loops at the ends for easy handling by the crane when necessary. But for storing the boxes in the racks the tiering machine shown in Fig. 6 is used. The steel box is deposited on the roller platform of the tiering machine as at *A*, and is hoisted to the desired level, when it is rolled off and onto the steel angles in the rack. The operator rides up and down with the elevator so as to be ready to push the box into its proper rack. The boxes are, of course, taken out by a reverse process. Each box has provision for a card giving its contents and location.

Large fixtures, and there are a lot of them, are stored in racks as shown in Fig. 7. These racks are substan-

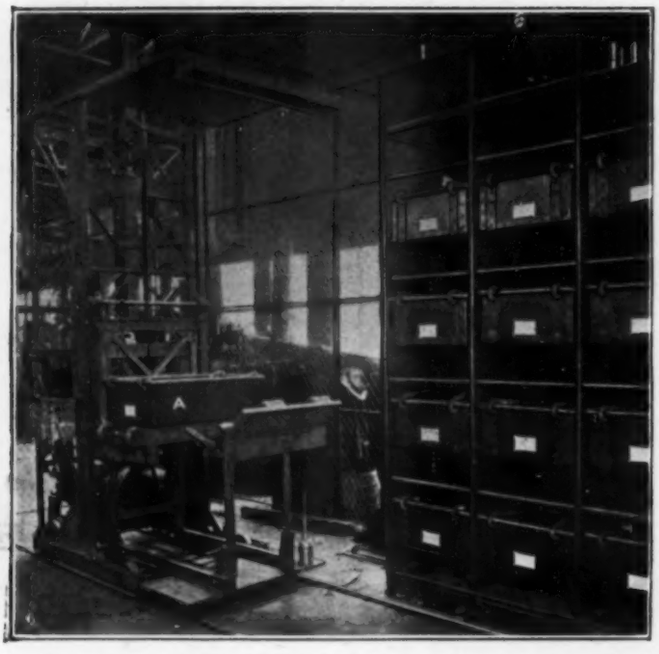


FIG. 5—WELDING STELLITE TIPS. FIG. 6—TIERING MACHINE. FIG. 7—STORAGE RACK FOR LARGE FIXTURES

tially built of steel angles and have frequent divisions so as to support drilling jigs and other fixtures, preventing them toppling on to others next to them. Fixtures of this sort are, of course, handled by the crane.

A good idea of the size of the work done may be had from Fig. 8, which shows a husky radial drilling

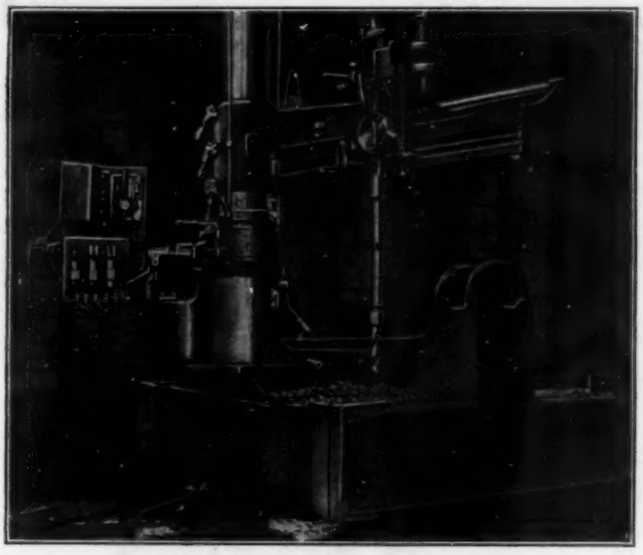


FIG. 8—USING A RADIAL AS A PORTABLE DRILLING MACHINE

machine, made by the American Tool Works Co., in place on the platform of a huge steam shovel. The machine is picked up by the crane and placed on the platform in any desired position, being moved from time to time as the work demands. Extension-drill holders enable holes to be drilled in the floor of the crane platform at any desired point.

Origin of the "Marion" Square

This shop uses a great number of large-size drills and the problem of twisted tangs made itself felt so, what is known as the "Marion Square" was adopted

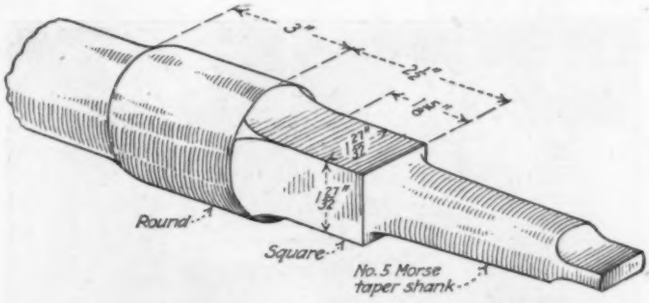


FIG. 9—DETAILS OF THE "MARION SQUARE"

for all drills and similar tools beginning at 2¼ in. diameter. The shank is a No. 5 Morse taper and below is the substantial square 1 27/32 in. on a side and 1⅝ in. deep as shown in Fig. 9. Full details as to the shape and dimensions are given in the illustration. Drills so made have been found very satisfactory in every way for heavy work, and suitable drivers are provided on the spindles of all the large drilling and boring machines in use in the factory at the present time. Such tools might be used to advantage in many other plants.

Repairing Torn Tracings

By G. F. Bradstreet

Tracings worth well up in the hundreds of dollars often become more or less torn in erasing and handling. A small tear rapidly becomes a large one unless quickly repaired and usually the tracing must be entirely retraced or else patched in a more or less unsatisfactory manner.

A new method of repairing them consists of applying a coat of flexible collodion. We are using at present Squibb's flexible collodion or liquid court plaster put up in a small bottle with a glass rod through the cork and find it very convenient. The torn edges are first brought together as smoothly as possible and then a layer of collodion quickly applied. The whole tear can be done at once, or any part of it. The collodion should not be applied too thickly and should extend beyond the edges of the tear about ⅛ in. or more. When the collodion is fairly dry and has turned a milky color, the repaired portion of the tracing should be placed on some hot surface. We use a steam heating pipe, first covering the pipe with white paper to keep the tracing clean. The milky color quickly disappears and becomes perfectly transparent, and where it has overlapped the edge of the tear it soaks into the cloth and practically becomes part of it. This takes only a few minutes and we find that the repaired part can be inked upon and erased several times without difficulty of any kind. An electric flatiron would probably furnish the heat in a most satisfactory manner. Small holes can be filled in without trouble and large ones can be repaired by inserting a piece of tracing cloth cut to fit and following the same procedure.

The above method has been in use for about three months and the first repairs are as strong today as new tracing cloth.

What Is the Foreman's Job?

By A. W. Forbes

"Many training leaders, particularly those working outside of production, have been decidedly opposed to utilizing the foreman as a teacher." This is quoted from page 178, Vol. 58, of the *American Machinist*. At the bottom of the same page we find the statement, "Under any circumstances the instructor should be entirely free, so far as the instructional phase of the work is concerned."

It would appear from this that the foreman should have nothing to do with the way the men do the work, though it is certainly out of the question to have one person entirely free in instructing the men in the way the work was to be done, and then have another direct them to do it differently.

I worked in one department of a large plant where it seemed to work out this way. I was in the department for about three months, and during this time I do not think I saw the foreman do a single thing except attach his signature to our time cards. Yet I think it was the best-managed department I ever worked in. It did not take long to get acquainted with the older men who knew the ropes, and after that if there was nothing to do with the group I was working with, there was always someone else near by who had work for me, so I did not need to bother the foreman. So far as I saw no one else bothered him either.

Ideas from Practical Men

Devoted to the exchange of information on useful methods. Its scope includes all divisions of the machine building industry, from drafting room to shipping platform. The articles are made up from letters submitted from all over the world. Descriptions of methods or devices that have proved their value are carefully considered, and those published are paid for

Casting Brass Bushings

BY E. A. THANTON

In our shop we use large numbers of brass and bronze bushings, most of which are from one to three inches in diameter and none over three inches long. For a long time we made our patterns so as to cast the bushings horizontally and several times as long as the finished bushing. Both sides of the type of pattern plate originally used are shown at the right in Fig. 1. Made in this way, cores had to be used and the bushings often were eccentric, porous or only partly filled out. After being cast the bushings were chucked, bored, turned and cut off to length. The whole process proved too expensive and we were losing money on them all the time. Something had to be done to reduce the cost so I went over the problem thoroughly and finally

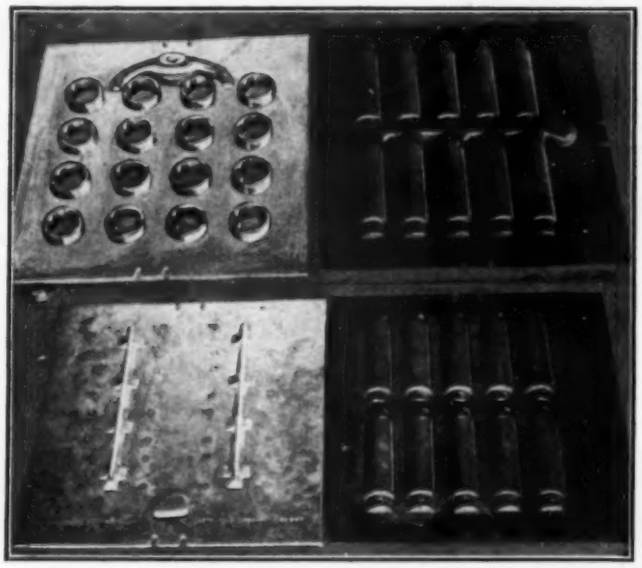


FIG. 1—NEW AND DISCARDED TYPES OF BUSHING PATTERNS

evolved the type of pattern plate, both sides of which are shown at the left in Fig. 1. The individual bushing patterns are made just enough longer than the finished product to allow a cut to be taken off each end. A slight taper is allowed inside and out so that the patterns will draw well. They leave their own cores, as can be easily seen, and very little work is needed to smooth up the runners and gate.

A lot of the bushings, just as they come from the molds, are shown in Fig. 2. This lot was cast from patterns of the same type as shown at the left in Fig. 1, although in this case more bushings are cast at the same time.

In machining the bushings, they are chucked, bored and one end faced. They are then placed on a mandrel and the outside and the other end finished. Actual

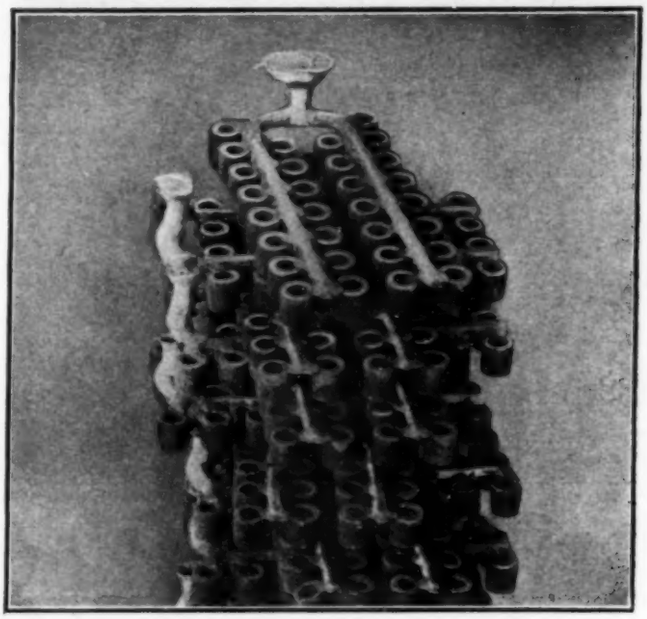


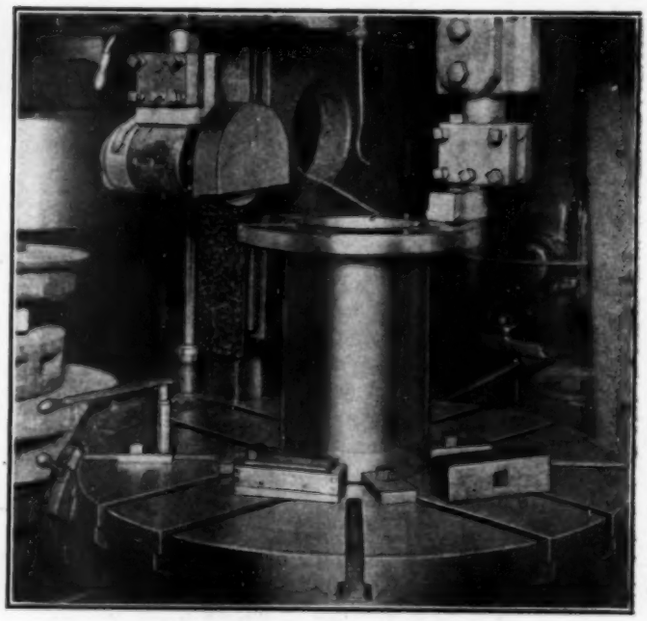
FIG. 2—BUSHINGS JUST AS THEY COME FROM THE MOLD

figures show that bushings made by our present method cost approximately but 30 per cent of the cost of turning them out in the old way.

Finishing a Thrust Bearing

BY HERBERT F. CRAWFORD

The illustration shows an interesting and unusual method of finishing a spring thrust bearing in the shops



LAPPING A THRUST BEARING

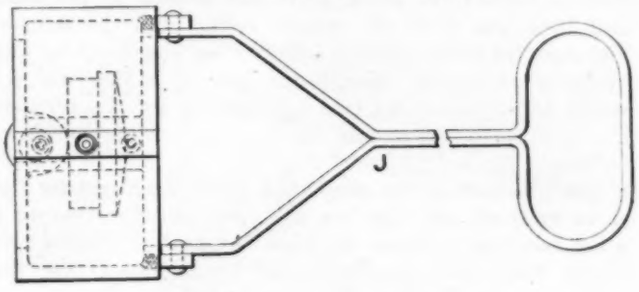
of the General Electric Co., Schenectady, N. Y. The bearing itself is of hard gray cast-iron and has radial grooves cut as shown. After turning and facing the thrust bearing surface, the collar is ground with the portable electric grinder shown, clamped in the left hand tool head of the boring mill. The abrasive wheel is alundum 66H,46.

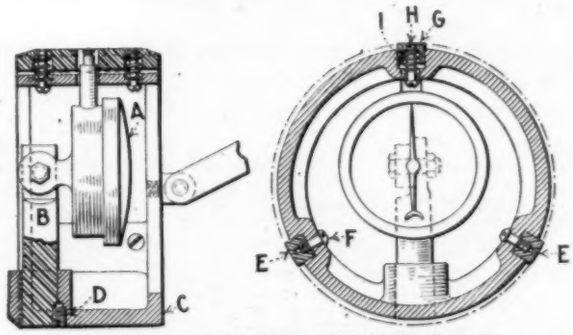
After grinding to a smooth finish the surface is lapped, using a fine abrasive stone 6 in. long and 2 in. square, held in the block in the right hand head as shown. The stone is known as grade 870, alundum. The small can fastened to the crossrail is used to feed kerosene on the surface during the lapping operation. The illustration shows the difference between the lapped surface and that of the rest of the bearing. The stone gives it a very high polish.

Cylinder Testing Gage

BY HARRY J. MURPHY

The accompanying illustration shows an indicating gage designed and used by the writer for testing the bore of a cylinder for variations in diameter, out of roundness and straightness. The gage is made up of a dial indicator *A*, reading either in thousandths or in ten-thousandths of an inch and mounted on a pedestal *B*. The pedestal is of colled rolled steel, pressed into the





DIAL GAGE FOR CYLINDER BORES

body *C*, and anchored by screw *D*. The body *C*, is an aluminum casting.

The two stationary wearing strips *E*, are set in grooves planed in the body and secured in place by screws *F*. The movable strip *G*, is held in another groove, being retained by two screws *H*. The springs *I*, force the movable strip out against the cylinder wall and as the three strips are equally spaced and accurately ground for diameter, they centralize the gage in the bore. The strips are made of tool steel, hardened and ground all over. The handle *J*, is made of light strip steel to a length necessary to reach to bottom of the cylinder.

When using the gage in cylinders having the heads cast integrally, a small flash bulb with a battery may be attached to the handle so as to illuminate the dial of the indicator.

A standard ring (not shown) made to the exact size of the cylinder bore is used for setting and checking the gage. This gage is very light and sensitive. It tells accurately the size of the bore and shows any variations there may be in the machining or grinding.

A Long Range Drilling Job and How It Was Done

BY REUBEN KELPIE

A condenser, containing many hundreds of soft copper tubes, had been completed and was ready for shipment when it was found necessary to add several more tubes to meet new requirements. The shell of the condenser was 16 ft. long with cast iron heads bolted to the ends and with a partition, also of cast iron, midway of the length for the purpose of supporting the tubes at the center and preventing them from sagging unduly.

It was found after consideration that the only place

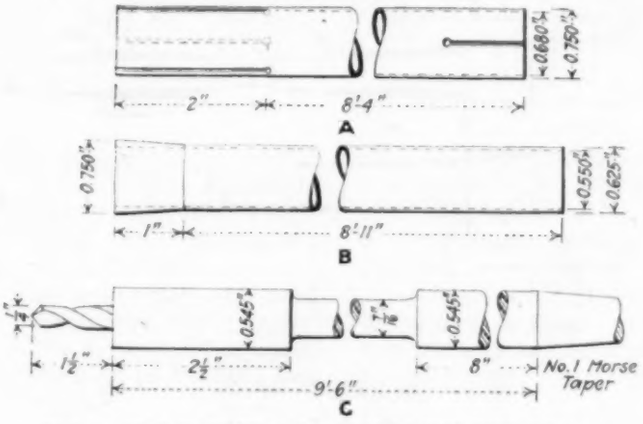


FIG. 1—THE DEVICES FOR CENTERING THE DRILL

where additional tubes could be inserted was around the outside of the nest of tubes already in place and adjacent to the shell, and that there were just sufficient spaces to get in the desired number of new tubes. Further, the tubes already in place were so closely spaced and so close to the shell that there would remain a wall of cast iron but $\frac{3}{16}$ in. thick between the holes for the new tubes and those already placed.

Locating and drilling the holes in the heads for the new tubes was a very simple matter, but drilling the partition—8 ft. away from the nearest possible point of manipulation—was quite a different proposition. It was reasoned that were a $\frac{11}{16}$ in. drill with a shank 8 ft. long to be operated in this restricted space and left to find its own location it would not only *not* drill to center of the space but would, in all probability, ruin one or more of the adjacent tubes in wabbling or running about to get a start. It was, therefore, necessary to devise some positive means of locating and controlling the drill at the distant point.

The copper tubes in the condenser were $\frac{3}{4}$ in. outside diameter and the holes in the heads and supporting partition were $\frac{11}{16}$ in., the tubes being expanded in the heads to make a tight joint. The outfit used to drill the extra holes in the partition and the manner of doing the work are shown in the accompanying sketches.

A piece of steel tube, *A*, Fig. 1, $\frac{3}{4}$ in. outside diameter

and with 0.035 in. wall, was cut to a length of 8 ft. 6 in., and one end was slit with a hacksaw in three places 120 deg. apart so that the end of the tube would act as a three-fingered collet. The other end was slit in two places so that it could be compressed upon an inner member by means of a clamp.

Another steel tube, *B*, $\frac{5}{8}$ in. outside diameter and 9 ft. long was fitted at one end with a short tapered bushing $\frac{3}{4}$ in. diameter at the large end to act as an expander for the collet end of the outer tube. A shank *C*, 9 ft. 6 in. long, having a $\frac{1}{4}$ in. twist drill secured at one end and a No. 1 Morse taper turned upon the other end, was fitted to rotate freely within the inner tube.

In the upper part of Fig. 2, may be seen the manner of application. The three parts assembled were pushed in through the previously drilled $\frac{13}{16}$-in. hole in the outer head of the condenser until the collet end of the outer tube rested against the partition. Holding the outer tube stationary, the inner tube would now be pulled back to expand the collet end of the outer tube until the three fingers rested against adjacent copper tubes

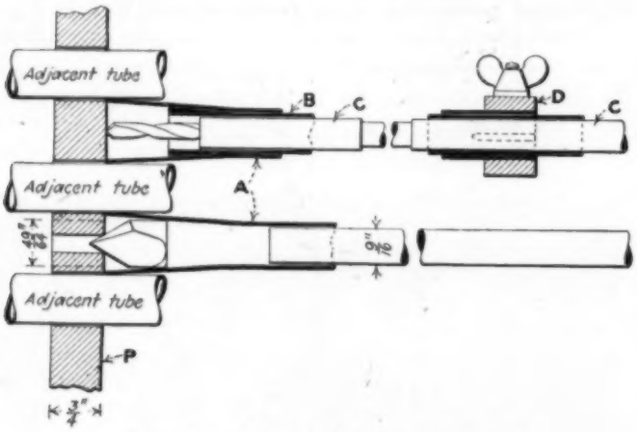


FIG. 2—THE METHOD OF APPLICATION

or against the wall of the condenser. In this position the two tubes would be bound together by the clamp *D*. It could now be expected that the $\frac{1}{4}$ in. drill would drill reasonably close to the center of the space.

The application of the sizing drill is shown in the lower part of Fig. 2. In this case the inner tube was dispensed with and a $\frac{13}{16}$-in. stub drill was welded to a $\frac{5}{16}$ in. rod 9 ft. 6 in. long. The end of the cord next to the drill was turned to the same taper as the expanding bushing used on the inner tube in the previous operation and served the same purpose. The point of the drill was made unusually long, as indicated in the sketch, and the cutting lips kept sharp. The duty of the outer tube in this case was merely to guide the larger drill into the already drilled $\frac{1}{4}$-in. lead hole.

To make certain that the large drill was properly entered in the lead hole we first used a hand brace to rotate it. If there was little or no resistance to the rotation we knew that the point of the drill was bearing upon solid iron, and the tube would then be shifted about until the drill entered the lead hole. This condition would be indicated by the drill beginning to cut at once and the feeling of resistance was unmistakable. The drill would then be held firmly against the work while the brace was removed and an electric motor substituted. The devices shown worked in a satisfactory manner and enabled us to do a piece of work that would have been well nigh impossible without them.

Refitting a Crosshead and Guide

BY FRANK ERVIN

In making repairs on a steam engine we found that the lower side of the crosshead and the guide upon which it slides were so badly worn as to necessitate replaning both surfaces. The guide was of the type shown in Fig. 1 and took its bearing directly upon the engine frame, the throat of which had originally been bored to line with the cylinder. The radius of this bore was $10\frac{1}{2}$ inches.

We first set up the guide on the planer with the grooved side uppermost and planed sufficient stock off

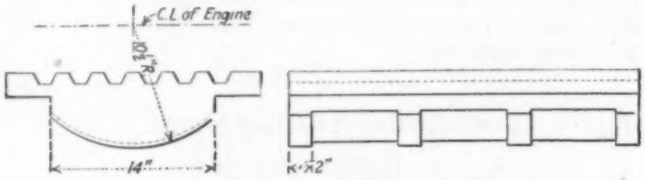


FIG. 1—THE GUIDE FOR THE CROSSHEAD

both top and bottom of the grooves to allow for finishing the sides to the original width. Then the tool-slide was set over to the corresponding angle and one side of all the grooves planed. A block, clamped to the cross-rail, enabled us to make micrometer measurements when moving the saddle along from one groove to the next and thus get them all spaced evenly and the correct distance between centers. Swinging the head to the opposite angle, we planed one groove to the correct width and then set the tool successively for the remaining grooves by means of the micrometer and block as before.

The grooves in the crosshead were machined by the same method, and the two parts scraped together to a good bearing. When we had finished this work we found that the crosshead, on being placed in the engine, was 0.335 in. below the center line, and it was necessary to bring it back by putting liners under the guide.

The four pads on the under surface of the guide were

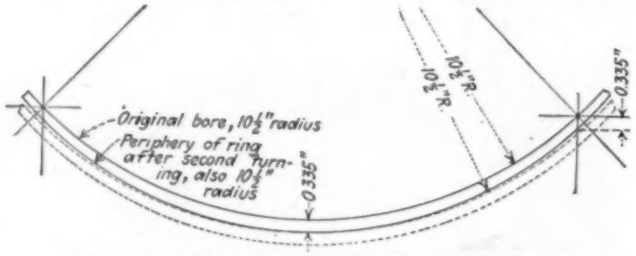


FIG. 2—LAYOUT OF THE SEGMENTAL LINER

2 in. wide and, of course, turned to the same radius of the throat of the engine frame. The liners must, therefore, be about 2 in. wide and of a crescent shape, 0.335 in. thick in the middle and tapering toward each end. The way we made them was as follows:

A ring of cast iron 2 in. wide was bored to the required radius of $10\frac{1}{2}$ in. and then cut apart at four equal points, the amount of metal taken out at each cut being equal to the hypotenuse of a right-angle triangle having equal sides of 0.335 in. This amount, determined mathematically, is 0.47375 in. and is measured as a chord along the surface of the bore.

The segments were then laid upon the table of a

boring mill with the cut ends butted tightly together and the composite ring thus formed was accurately centered. Turning the outside to exactly 21 in. in diameter then gave us four liners with 10½ in. radius outside and also 10½ in. radius inside, with a thickness of 0.335 in. at the middle and tapering uniformly toward each end as was required.

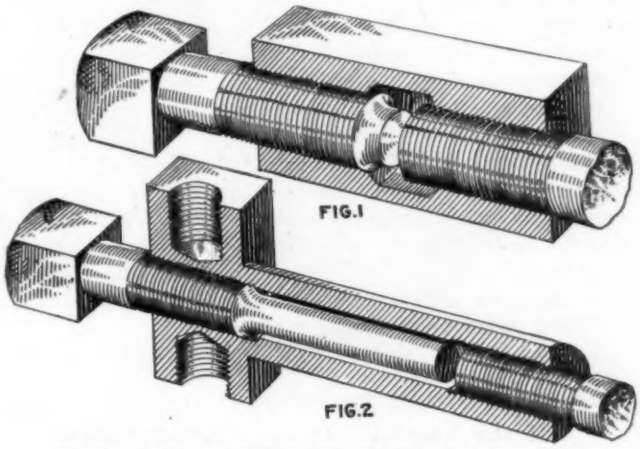
The drawing, Fig. 2, shows how the mathematics were worked out. The dotted lines show the outside diameter (theoretical; the actual diameter before the final turning was not essential so long as it was big enough) both before and after the segment had been moved in toward the center. The full lines show the actual shape of the finished segment. The outer full line also represents the bore of the ring before it was cut apart.

Two Quick-Acting Stud Drivers

By John B. Irvine

Having read with interest the article on the above subject by Lee Jackson, published on page 1007, Vol. 57, of the *American Machinist*, I am taking the liberty to submit sketches of a couple of simple and inexpensive, as well as very efficient, stud drivers.

The driver shown in Fig. 1 is made from a piece of



FIGS. 1 AND 2—TWO STYLES OF STUD DRIVERS

square cold rolled steel, pack hardened after finishing. It is tapped right hand at one end for the stud, and left hand at the other end for the special setscrew. It should be relieved in the center if practicable in order to prevent trouble from burring up or swelling of the screw.

Studs are driven home by means of a large wrench on the body of the driver. A sharp right hand turn of the setscrew then releases the hold and there is no tendency to start the stud, as the loosening is done in the direction of driving the latter.

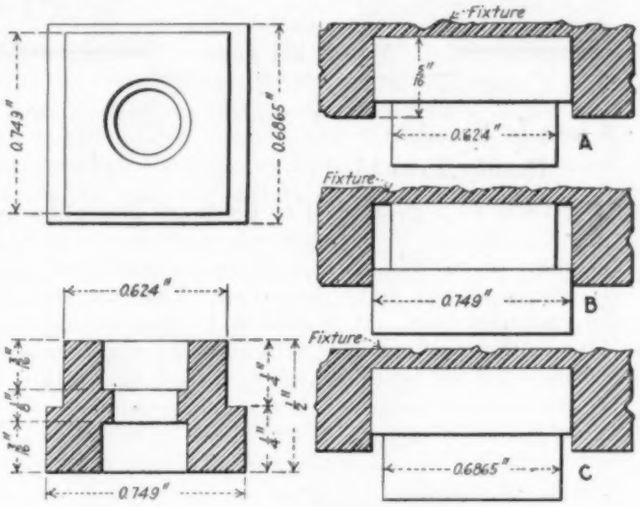
In Fig. 2 the body of the driver is made from a piece of 1x2-in. cold rolled steel 6 in. long, turned to the shape shown to within 1 in. of the end and tapped for handles, which can be of any length desired. This driver is similar in operation to Fig. 1, and will be found to be very convenient where studs have to be driven close up to some long projection, such as the bridge of valve yokes, on bonnets, and similar places.

Any mechanic can make one of these stud drivers and if he once uses it, he would not be without it for many times its cost.

Single Key for Two Slot Widths—Discussion

By H. E. Butters

In an article under the above title on page 352, Vol. 57, of the *American Machinist*, Stephen McEvoy showed a key for fixtures that is adaptable to two widths of



A KEY THAT WILL FIT THREE WIDTHS OF SLOTS

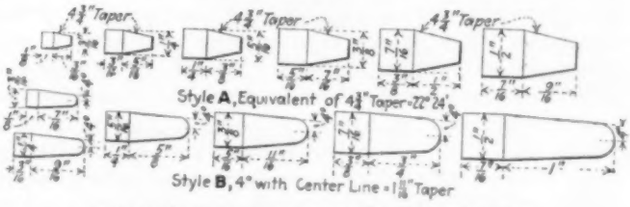
T-slots in milling or other machine tables.

In the attached sketch, I have illustrathed a key that is adaptable to three sizes of T-slots, namely, ⅝, 11/16 and ¾ inch. For use in a ⅝-in. slot the key is placed in the fixture as at *A;* for 11/16 in. as at *C*, and for ¾ in. the key is inverted and placed in the fixture as at *B*. The slot in the fixture is cut 0.749 in. wide by 5/16 in. deep. The key is made of machine steel, cyanide hardened and has been in use for a long time and proved highly satisfactory.

Standard Sizes of Corebox Dowels

By E. A. Arthur

We use a very large number of metal coreboxes for brass valve work, and for some time have had trouble with the dowels used to properly register the two parts



STANDARD SIZES OF COREBOX DOWELS

of the box. After considerable discussion by the heads of the various departments concerned, we adopted the uniform sizes shown in the illustration. These dowels are made on Brown & Sharpe automatic screw machines in large quantities and are always ready for use for new or repair work.

Whenever a drawing for a new corebox is sent to the toolroom, the size of the dowels to be used is specified and also whether they are to be style A or B, then the required number of dowels is requistioned from the storeroom.

American Machinist

Established 1877

KENNETH H. CONDIT AND FRED H. COLVIN

Editors

March 29, 1923

When Is Trouble Really Trouble?

THERE IS a great deal of hesitancy about the use of automatic or complicated machinery and particularly so in the machine shop. Complicated machinery is used in many industries. Take for example the Jacquard loom. It is difficult to imagine any machine in the machine shop with as many pieces as such a loom. Yet we never heard of anybody hesitating to use the machine because it has so many elements which might get out of order. Neither have we heard of anybody refusing to use it because it takes quite some time to set it up, nor of anybody condemning it because it takes an expert to run it.

Nevertheless, these three arguments are very frequently heard in the machine shop, or generaly speaking, in metal working establishments, when a more or less complicated machine or tool is being discussed. The expression is that such a machine gives trouble. We hear that it takes too long to set it up and often we are told that it works all right when it works, but that a good mechanic is needed to attend to it about half the time.

These arguments against the use of complicated machinery are so well known that it is hardly necessary to give examples. Everybody has heard them and most of us have seen fine pieces of machinery stand idle somewhere because the shop men say, "the thing gives too much trouble."

It may be true that a certain machine requires the attention of a first class mechanic half the time (though as a rule this fifty per cent is very much exaggerated and is probably reduced to less than ten per cent when it is closely analyzed) but even if it does require all that attention, what do we care so long as the total performance of the machine is profitable? We should look at it this way: Labor costs so much per year, interest and depreciation so much, attendance and repairs so much, and if all these things together amount to less than the cost of the separate operations before the installation of this machine then it is earning its keep and we should consider all of the factors mentioned as legitimate items in the cost of production of the article. In other words, paying for the skilled mechanic who sets up and adjusts the machinery, and perhaps repairs it, is just as much a part of the labor cost as the wages of the operator.

We shall make progress in the machine shop if we quit the use of the word trouble in the sense described above. When the countershaft falls down that is trouble, when there is such a heavy snow fall that the skylight breaks, that again is trouble, but when a machine needs adjusting or repairing it is no more trouble than the sharpening of a tool or the renewal of stock. When the item of adjusting and repairing becomes so great that the total cost of the operation exceeds the cost of producing the piece with simpler machinery we should give up the use of complicated machinery, but when it is less we should continue to use the machine and not talk about trouble. There isn't any.

Transportation Problems At the Chamber of Commerce Meeting

THE ADVANCE program for the annual meeting of the Chamber of Commerce of the United States in New York early in May indicates that two big subjects of vital interest will be discussed. The return of the American delegation from the meeting of the International Chamber at Rome will bring a fresh viewpoint to the discussion of our relations with European countries. From the domestic angle, the legislative threats of certain recently elected members of Congress will stimulate business to get together and decide what it wants in the way of co-ordinated transportation and what sort of legislation it should get behind to secure the desired ends.

Four aspects of the transportation problem will be considered, the co-ordination of rail, water and motor transport, railroad consolidation, the railroad rate structure and the relations of the railroads to the government. Only a short time ago it would have been virtually impossible to get representatives of the various interests involved together on any of the points mentioned but conditions have changed in the last few months and a broader view of the problems exists. It is perhaps not too much to hope that the Chamber Meeting may evolve ideas that will lead to a sound national policy on transportation.

Applying a Recommendation of the Unemployment Conference

MR. HOOVER'S recommendation to the President that work on public enterprises be held back until private building has had a chance to catch up its arrears is a welcome indication that not everyone in authority had forgotten the Unemployment Conference of a year ago. If the Commerce Secretary's advice is heeded we shall avoid the spectacle usual in prosperous times of the government departments bidding against each other and against industry for the use of building materials and the services of construction labor.

The Unemployment Conference made one of its sanest recommendations when it urged that public works be pushed in times of business depression to relieve the hardships of unemployment. Such a policy would have a three-fold benefit. It would ameliorate the condition of labor in dull times. It would tend to prevent runaway labor and material markets in good times by cutting down the number of bidders for the available supply. And, finally, it would do much to flatten out the business cycle curve by holding down the peaks and filling in the valleys.

Shop Equipment News

Niagara No. 512 Straight-Sided Press for Hot Forging

Hot forgings of certain types can be produced in large quantities by means of a straight-sided press recently developed by the Niagara Machine and Tool Works, 637 Northland Ave., Buffalo, N. Y.

The machine, illustrated in Fig. 1, is designated as the No. 512 press. It is a single-crank press of steel-tied frame construction and is modified for hot forging work. A double-disk friction clutch and double back-gears, shown in Fig. 2, are provided.

The automatic dial feed of ratchet type consists of a circular disk to which intermittent motion is imparted by connections from the crankshaft. The disk, as can be seen in Fig. 3, is made with holes to receive interchangeable bushings that are shaped to receive the hot blanks. The dial has an unusually long period of rest to make deep forming operations possible and to give the heated blank the necessary time under the pressure of the dies. Between each working period the dial moves rapidly. In order to accomplish this, its motion is taken from the end of the crankshaft by means of a crank plate and a slotted lever.

The blank after having been automatically fed to the die and pressed to shape, adheres to the punch as the latter rises, but is stripped off automatically. In the meanwhile, a sloping sweep swings out to direct the fall of the forging to the rear of the press. Simultaneously, the dial feed brings the next blank between the dies.

A relief mechanism, also illustrated in Fig. 3, is provided in case there should be an overload. It consists of an hydraulic release attachment to the bed. The bolster that carries the dial feed and die is mounted on a steel plunger supported by water pressure, ordinary city-water pressure being sufficient to hold up the plunger under normal load. To prevent a back flow into the feed line, a check valve is provided in the feed pipe. A hydraulic release valve is placed in an outlet from the cylinder and it can be set so as to open when the rated capacity of the press is reached.

If a cold blank or an oversized blank, which would produce an overload, should be fed into the die, the bolster, upon the opening of the hydraulic relief valve, is depressed under the increased pressure due to the overload. The action thus protects the press from overstrain. When the pressure is relieved, the bolster rises to the correct working height in time for the next stroke of the press, and the forging operations continue without interruption.

The manufacturer claims three features for the press: namely, an increased output over non-automatic devices due to its automatic feeding and ejecting mechanism; a quiet, steady, non-intermittent operation, requiring a minimum amount of operating skill and attention in con-

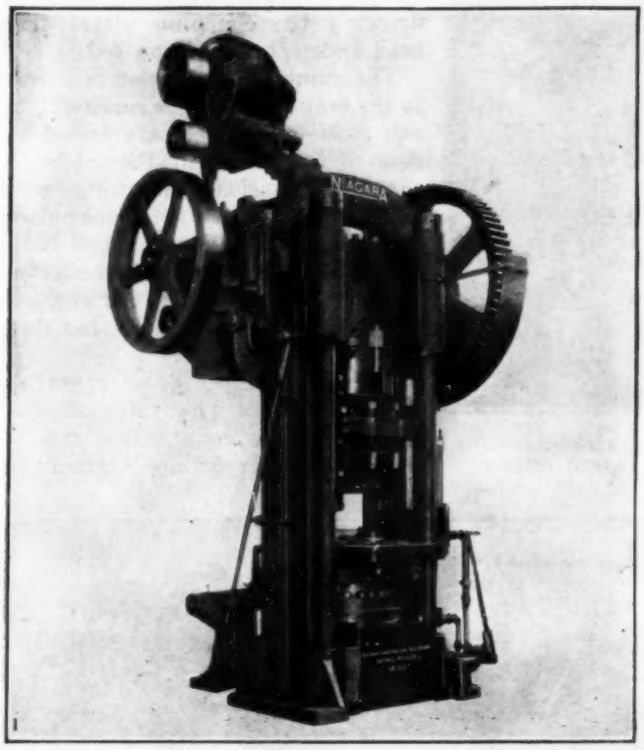


FIG. 1—NIAGARA NO. 512 STRAIGHT-SIDED PRESS FOR HOT FORGING.

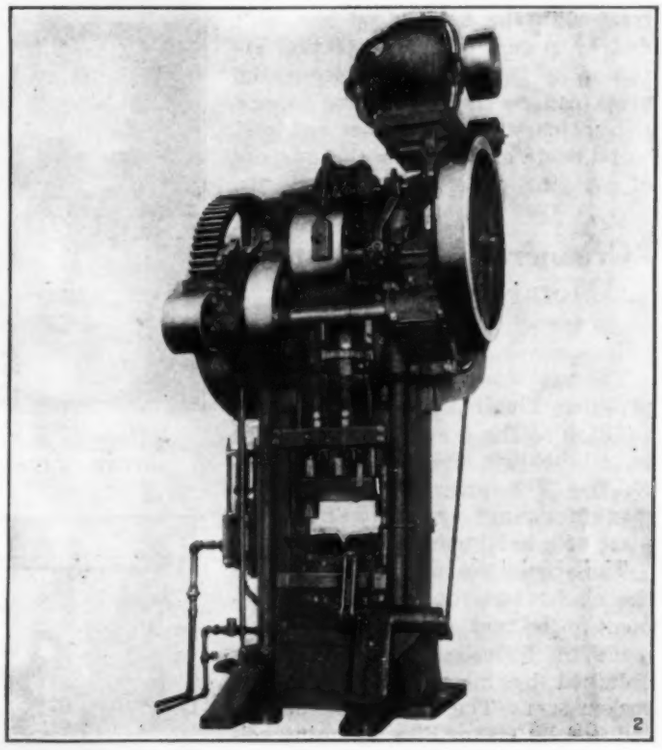


FIG. 2—REAR VIEW OF PRESS SHOWING BACK-GEARS

FIG. 3—DIAL FEED AND HYDRAULIC RELEASE ON NIAGARA FORGING PRESS

trast with the noisy drop hammer; and by reason of the protection afforded by the hydraulic release, the press can be limited in size to suit the ordinary load, and does not need to be made oversize for the purpose of carrying undetermined overloads.

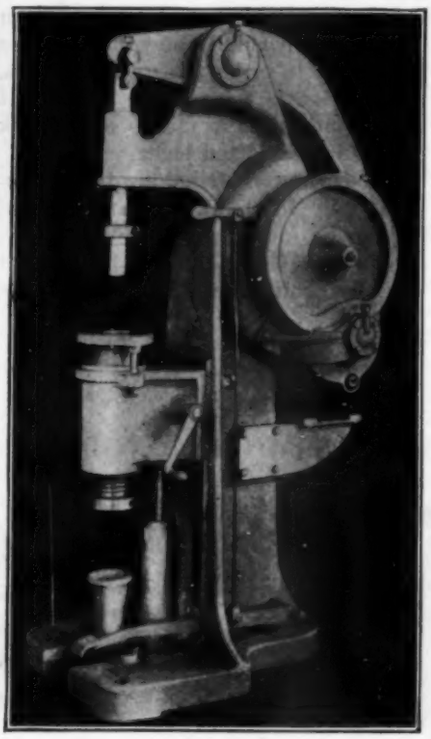
Greenerd Cam-Operated Motor-Driven Arbor Press

The machine shown in the accompanying illustration is the latest addition to the line of arbor presses built by Edwin E. Bartlett, Nashua, N. H. The press is intended for manufacturing work, to take the place of a hand-operated press.

The special feature of the press is the mechanism for imparting movement to the ram A maximum movement of 5 in. is possible and is obtained by means of a cam and rocker arm. The movement may be reduced by means of a clamping collar on the ram which prevents the complete return of the ram, and thereby reduces the effective throw of the cam. The cam is operated by a quick-acting Horton type of clutch, which can be engaged by either hand or foot. The gear reduction is 45 to 1, from a ½-hp. motor driven at 1,140 r.p.m. so that the cam revolves at the rate of 20 r.p.m. and a complete cycle is made every 3 sec. The ram has a quick return.

The end of the ram is bored out and threaded to receive special tools. The knee containing the work holding surface is adjustable as to height. The working table or abutment is yielding, its resistance to pressure being adjustable by means of a screw which compresses a helical spring. There is an opening 2½ in. in diameter through the abutment. A receiving pocket is attached to the base to catch the falling arbors.

The machine occupies a floor space of 24 x 42 in., is 73 in. in height, and weighs 1,575 lb. The distance from the ram to the frame is 9 inches.



GREENERD NO. 24 CAM-OPERATED MOTOR-DRIVEN ARBOR PRESS

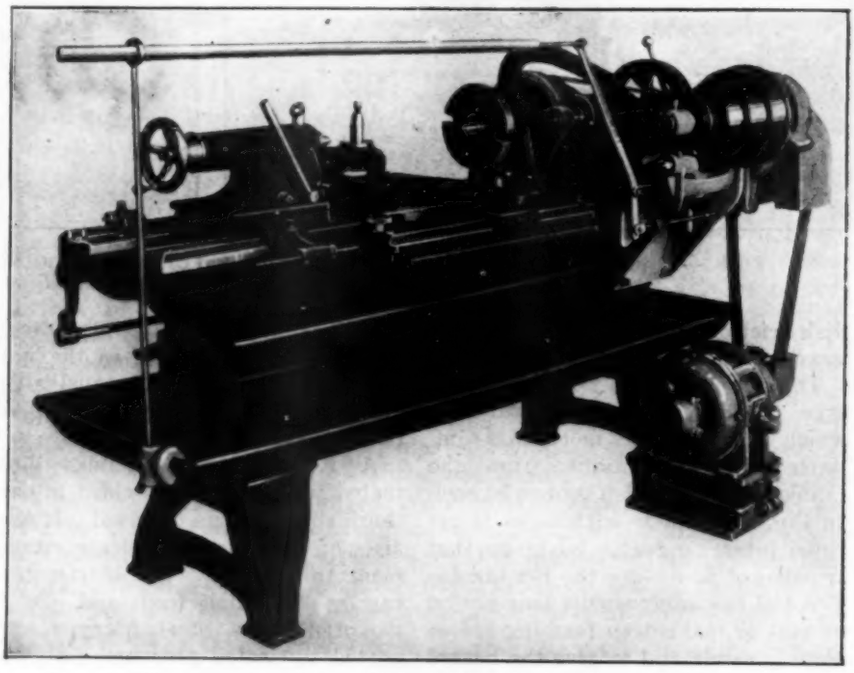
Hendey Motor Drive for Cone-Head Lathe

The need for a compact individual motor drive on lathes has lead to the recent development of a motor drive arrangement for cone-head lathes by the Hendy Machine Co., Torrington, Conn. The drive mechanism, shown attached to a 16-in. lathe in the illustration herewith, is applicable to the Hendey 12, 14, 16, 18 and 20 in. lathes of both past and present designs.

The countershaft unit consists of a base bracket clamped to the V of the lathe bed at the rear of the headstock. It is further secured by cap screws entering the lower part of the bed. The mechanism can be readily attached, as no machine work is necessary except drilling and tapping two holes in the side of the bed for the cap screws, and, in some cases, dressing the clamping plates that bear under the V of the bed.

The countershaft bracket is hinged to the main casting. It carries tight and loose pulleys that are belted direct to the pulley of the motor, a completely enclosed reducing gear and a countershaft with a cone pulley. The loose pulley runs on ball bearings. The tight and loose pulley as well as the motor pulley are enclosed with cast-iron guards having belt opening.

By means of the quick operating toggles and a hand lever, the countershaft and the cone pulley can be moved towards or away from the



HENDEY LATHE WITH CONE-HEAD MOTOR DRIVE

lathe spindle, thereby either loosening or tightening the belt.

A motor base with a platform, that is suitable for the motor selected, is provided. The platform is secured to the base proper by a large hinge pin at one end and by adjustment screws at the other. Being adjustable, the platform provides a means of keeping the motor belt at a desired tension.

The complete lathe unit does not obscure light or vision of the operator and occupies practically the same space as a lathe with a taper attachment. The unit can be obtained for any Hendey lathe, and it is furnished with or without a motor. A constant-speed a.c. or d.c. motor running at 1,200 r.p.m. is recommended. However, lower speeds may be used, and higher up to 1,800 revolutions per minute.

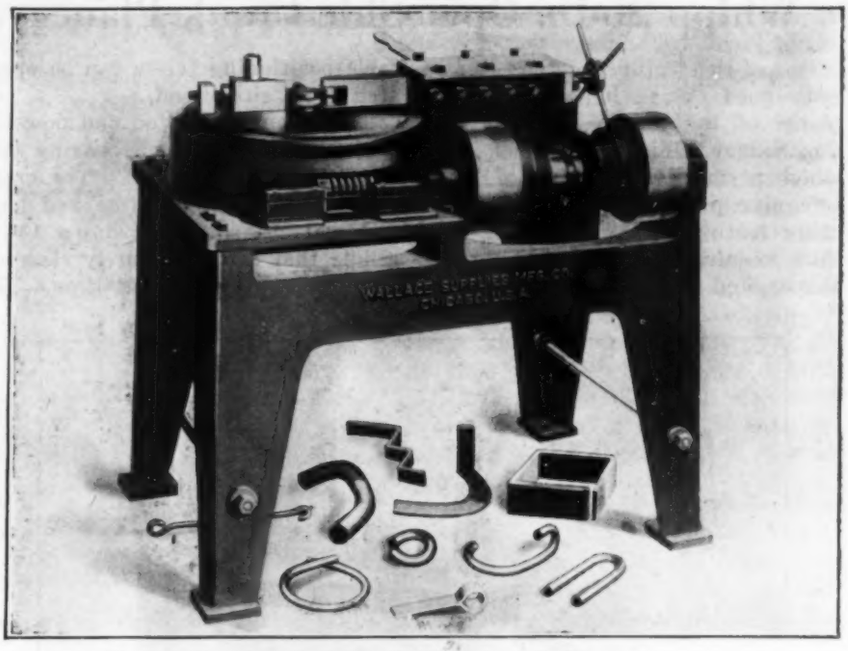
"D & M Junior" Guard for Punch Press

The accompanying illustration shows a safety guard intended as a protection for the punch press operator. The guard has recently been marketed by the Taylor-Shantz Co., 478 St. Paul St., Rochester, N. Y., and is known as the "D & M Junior."

"D & M JUNIOR" GUARD FOR PUNCH PRESS

It is similar in operation to the D & M safety press guard described on page 1265, Vol. 52 of *American Machinist*, but is of much simpler construction, having only nine parts.

The guarding arm of the safety device is automatically driven by the ram of the press. It sweeps across the bolster of the press and passes the dies before they close. A rubber cushion attached to the guard prevents injury to the operator's hand should the guard strike it.



WALLACE NO. 15 BENDING MACHINE

Provisions are made for changing the die space, the distance of the guard arm and the speed at which the guard arm travels, so that adjustments can be easily and quickly made. No changes are required in the press to which the guard is to be attached, and the installation is accomplished by drilling and tapping only two holes in the press. Practically any size of press can be equipped.

Wallace No. 15 Bending Machine

The latest addition to the line of bending machines of the Wallace Supplies Manufacturing Co., 412 Orleans St., Chicago, Ill., is the No. 15 machine shown in the accompanying illustration. It is intended for the hot and cold bending of metal bars, rounds, squares, flats, tees, angles and channels in shapes such as shown in the foreground of the illustration.

The machine is controlled by a hand lever located at the front and on the side opposite the tight and loose pulleys. It is provided with an adjustable stop mechanism, which gives a means for automatically stopping the rotating table at any predetermined point. A number of pieces can therefore be bent identical in shape to any desired number of degrees. The table rotates at 6 r.p.m.

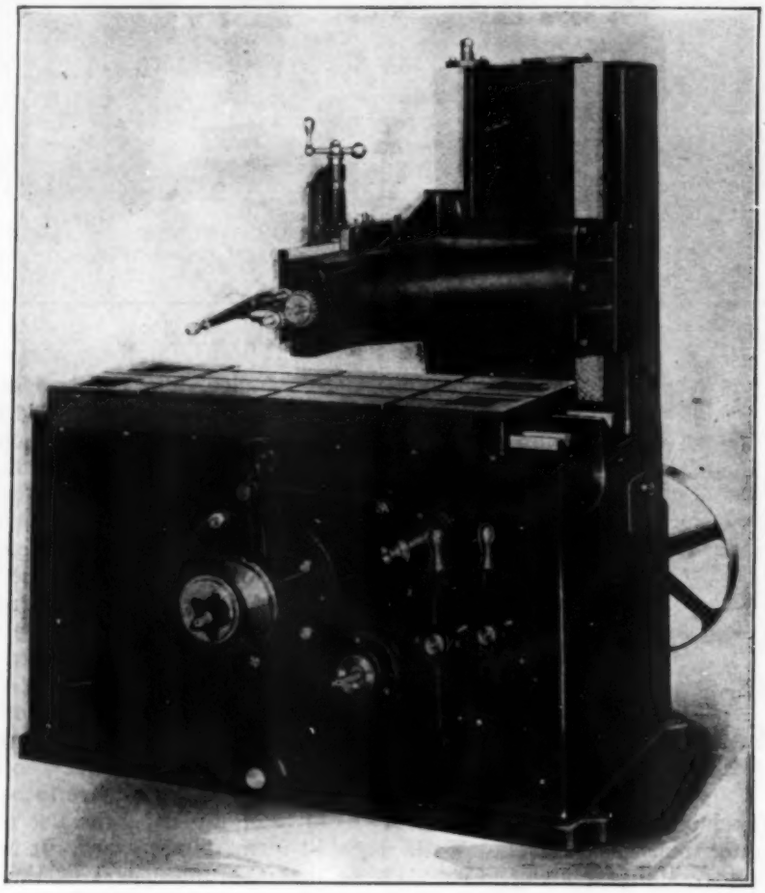
Production of work on the machine varies according to the number of degrees through which the material is to be bent, the length and kind of stock handled, and the size of the section of the work. The forming of materials on edge or the bending of angles consumes more time than when ordinary rods or bars are worked, on account of the greater difficulties encountered in handling and adjusting the former. The manufacturer claims that an average of 150 pieces per hour is possible when cold bending rounds, squares and flats bent flatwise to 180 degrees.

For cold bending flat stock on edge and angle irons, the average output is about 100 bends per hour. If the latter materials are to be bent more than 120 deg., the use of the "split form" is necessary. It is used so that the upper part of the form can be lifted after each bend has been made, to allow the removal of the finished part from the machine. It is said that the average production of this class of work is about 60 pieces per hour.

The radius of the bend must be limited to a maximum of 4 in. from the center of the circle to the outside edge of the material, or a circle 8 in. in diameter is the largest that can be formed. For cold bending, the following sizes are the maximum that can be handled: squares and rounds, 1 in.; flats, $\frac{3}{4}$ x 2 in.; and angles, 2 x 2 x $\frac{1}{4}$ in. For hot bending, the maximum sizes are, squares and rounds, $1\frac{1}{2}$ in.; flats, $\frac{3}{4}$ x 2 in.; and angles $2\frac{1}{2}$ x $2\frac{1}{2}$ x $\frac{5}{16}$ in. The machine occupies a floor space 3 x 4 ft. and is 3 ft. high. Its net weight is 950 lbs. A 3-hp. motor is sufficient to drive the machine.

Whipp 26-In. Open-Side Crank Planer

One of the features of the recently redesigned and improved crank planer of the Whipp Machine Tool Co., Sidney, Ohio, is the open side, which permits the planing of large irregular pieces. Due to this and other features it is fitted for work that requires either a planer or shaper, and it should be adaptable in the toolroom, repair shop, railroad and engine shops, schools and colleges where the use of both a planer and a shaper is not warranted.



WHIPP 26-IN. OPEN-SIDE CRANK PLANER

A heavy bed, as is shown in the illustration herewith, is provided. The table is 46½ x 17½ in. and has three ⅝-in. cross slots and three ⅝-in. longitudinal T-slots. Its ways are planed and scraped, and to insure positive contact with the bed full length gibs are provided at both sides. The length of stroke of the table can be quickly adjusted by means of the shaper type of stroke-adjusting mechanism. The crank arm is mounted on a bearing pin at the bottom of the bed, the upper end and table adjusting nut being connected by heavy double links. The table positioning screw can be operated from either end.

The column is bolted and doweled to the bed and has wide bearing surfaces for the cross rail. The cross rail has a 25-in. traverse and long and wide bearings. It has a 14-in. saddle that can be securely clamped to the column when in position. The saddle is provided with a taper gib. Together with the swivel and vertical slides it provides cross, vertical and angular power feeds.

A single driving pulley 20x3¼ in., running at 900 r.p.m., gives six changes of table speed by the use of quick change gears. All the gears have wide faces, coarse pitch and bronze bushings. The sliding clutch is made of tool steel. Speed changes are made by operating two levers in front of the machine. A lever in front of the planer controls two friction clutches that are located in the quick-change box. One of the clutches operates the table at high speed and the other at slow speeds by throwing in the back-gears.

The six speeds provided vary from 7 to 70 table strokes per min., and are obtained by means of eight gears and clutches which are enclosed in a removable gear box. The gears all run in a bath of oil. It is claimed that all speed changes can be made with the machine in operation, but in engaging the higher speeds it is advisable to disengage the clutch control lever while shifting gears. The table drive is by a heavy shaper crank, operated by a bull wheel such as used in shapers.

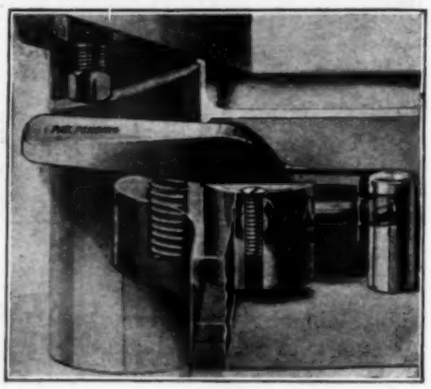
The feed control mechanism is like that used on planers. Horizontal feeds up to ⅜-in., vertical feeds up to ⅛-in. and angular power feeds are provided. The feeds may all be adjusted while the planer is in operation. The machine weighs 4,600 lb. net, 5,300 lb. crated and 6,200 lb. boxed for export. Its dimensions boxed for export are 50 x 76 x 68 in., and it has a volume of 150 feet.

Danly Gage and Stop for Die-Sets

Continuing its work of standardizing metal-working tools and machinery, the Danly Machine Specialties Co., 1613 N. Lincoln St., Chicago, Ill., has recently developed and marketed a work gage and stop applicable to almost any type of blanking die.

The device, as illustrated in section herewith, is a self-contained unit that can be attached to either a simple, progressive or compound die. The parts are made of drop forgings, screw machine products and two small springs.

To attach the stop to the die, it is merely necessary to drill three holes and plane or mill a groove ¼ x ⅛ in. long connecting two of these holes. The assembly of the stop in a stripper plate is made by drilling two small holes for screws that are furnished with the gage.



DANLY GAGE AND STOP FOR DIE-SETS

LeBlond 13-and 15-Inch Heavy-Duty Lathes

The line of heavy-duty lathes of the R. K. LeBlond Machine Tool Co., Cincinnati, Ohio, has recently been augmented by the addition of 13- and 15-in. sizes. The lathe is of rigid design to fit it to heavy work. It can be supplied with either a three-step cone head or with a single-pulley-drive geared head, and it can be motor driven and fitted with any of the standard types of rests, toolposts and attachments.

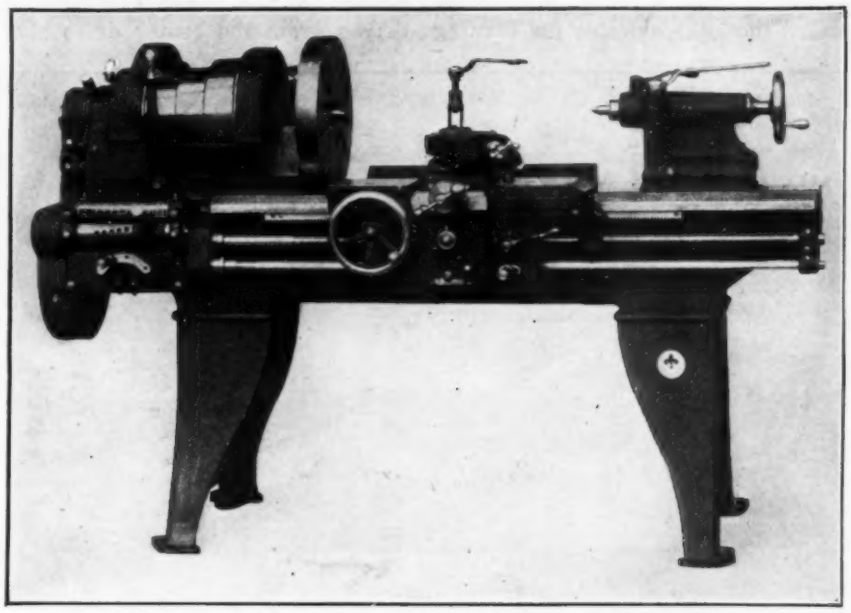


FIG. 1—LE BLOND CONE-DRIVEN 15-IN. ENGINE LATHE

The cone-head lathe, illustrated in Fig. 1, is equipped with double friction back gears. The headstock has the drop-brace construction with heavy ribs extending between the shears to provide rigidity, a construction which permits the use of large diameter cone pulleys. The spindle is a 0.5 per cent carbon steel forging. It runs in phosphor-bronze, babbitt-line split bearings. The end thrust is taken against the front end of the rear bearing housing. Lubrication is provided by oil wells in the bearing caps. The spindle nose is 2⅝ in. in diameter and has five U.S.S. threads per inch. A No. 3 Morse taper hole is furnished at the front end, and the through hole is 1¼ in. in diameter.

The two back-gears are provided with friction clutches on the quill shaft and are operated by a convenient lever for engaging and disengaging the clutches. The clutches consist of but three parts each, an expanding ring, a taper wedge and a double taper key. The gears are completely guarded. Eighteen spindle speeds ranging from 16 to 375 r.p.m. are provided.

The single-pulley-drive geared headstock provides nine changes of speed from 20 to 350 r.p.m. by the manipulation of two levers. The gears are of steel, and the sliding gears of hardened nickel alloy steel. Stub form teeth are employed. The shafts are multiple splined and the keyways in the gears are broached from the solid. The shafts run in bronze bearings and are short to increase the rigidity. The drive is to a large constant-speed pulley that runs on a bushing held by the headstock, so as to relieve the drive shaft of the belt pull. A multiple-disk clutch operated by a lever on the headstock is located inside the drive pulley. This type of drive and control was shown previously on the LeBlond 25- and 27-in. heavy-duty lathes described on page 90, Vol. 58 of *American Machinist*, and on the 11-in. heavy-duty lathe on page 979, Vol. 56. When the bed is 8 ft. or more in length, the spindle is started and stopped from the apron.

The headstock is filled with oil to the level of the front of the head. The rotation of the gears causes the oil to be circulated in a heavy stream to all the gears and bearings of the headstock and clutch.

The bed of the machine is of semi-steel, heavily braced and provided with the "compensating V" construction. This construction provides a bearing surface at right angles to the tool pressure on all diameters within the swing of the lathe, and it automatically compensates for the wear of the carriage and the bed, to keep the carriage gibs in adjustment and tight under long service.

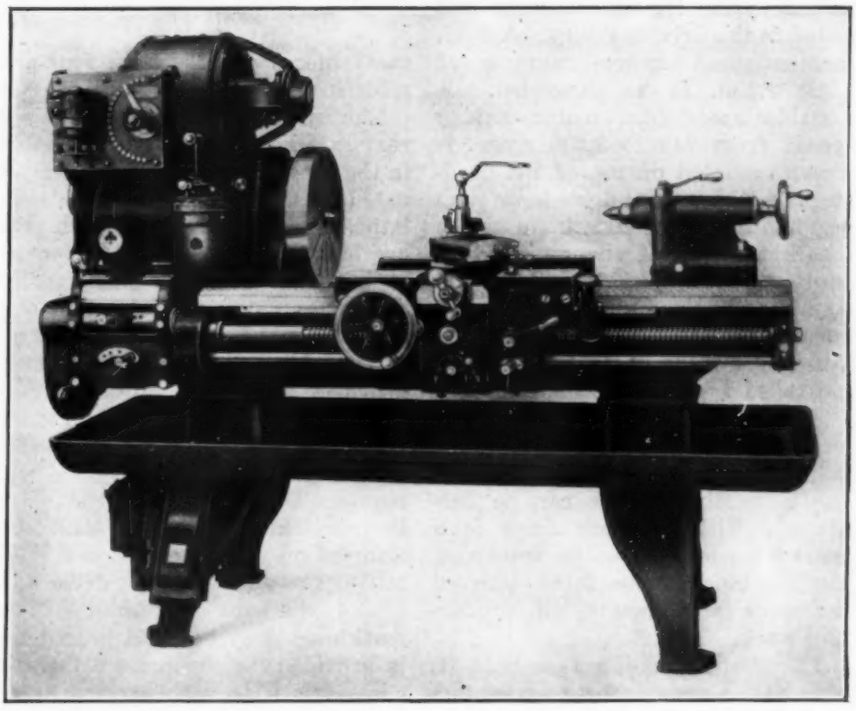


FIG. 2—LE BLOND 15-IN. VARIABLE-SPEED GEARED MOTOR DRIVEN LATHE

The tailstock has a spindle 2 in. in diameter and is provided with a set-over to aid work on tapers. The apron is of the LeBlond box-section

type in which all shafts are supported at each end. The body of the compound rest is set at an angle of 60 deg. with the T-slot for the toolpost, to prevent interference with the cross feed screw handle when turning large diameters. Both the longitudinal and transverse feeds are engaged by a single positive jaw clutch, and gears are employed in engaging the different feeds. A separate rod is employed for driving the feeds. The feeds by means of the rod and the screw-cutting feeds are interlocked to prevent the engagement of both at once.

The quick-change gear mechanism is complete in one unit and consists of a box to be mounted on the front of the bed below the headstock. The gears are of steel and have stub teeth. Thirty-two feeds ranging from 12 to 184 are provided. Threads from 3 to 46 per inch can be cut. Metric lathes can be supplied for cutting pitches specified in millimeters.

The taper attachment can turn tapers up to 3 in. taper per foot, and 15 in. long at one setting. It is bolted to the carriage and can be used any place along the bed.

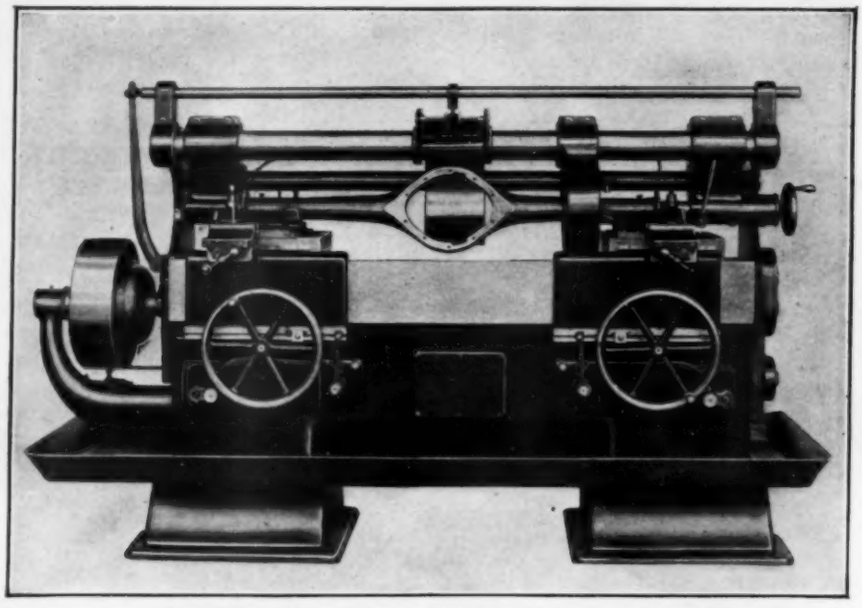
Two types of motor drive can be furnished. One consists of a motor mounted on an adjustable plate attached to the leg of the lathe and belted to the driving pulley. A 2-hp. constant-speed motor running at 1,750 r.p.m. is recommended. A variable speed, d.c. motor having speeds from 740 to 2,200 r.p.m. is shown mounted on top of the headstock in Fig. 2. The drive is through gearing to the headstock, in which the first series of change gears is omitted. The unit is complete with a starting box and all necessary electrical equipment. On lathes having a bed longer than 6 ft. the motor is controlled from the apron.

For manufacturing work where large quantities of plain turning and facing is done, but no screw cutting, an "automobile" lathe can be furnished. Either a cone drive or a geared headstock can be employed. The machine can be fitted with all necessary attachments for production work.

The lathes equipped with 6-ft. beds have a distance between centers of 2 ft. 7 in. The 13-in. lathe has a swing of 15 in. over the shears, and the 15-in. lathe of 16¼ in. The tool sizes are ½ x ¾ in. and ⅝ x 1 in. respectively, on the two sizes of lathes. The shipping weights are, 1,800 and 2,015 lb., respectively.

Sundstrand Double-End Turning Lathe

A lathe that is built for such work as turning axle shafts, rear axle housings, camshafts and similar parts which can advantageously be turned at both ends simultaneously has recently been marketed by the Rockford Milling Machine Co., Rockford, Ill. The short narrow housing enclosing the driving mechanism makes the lathe suitable for turning short pieces also, such as four-arm spiders and universal joint crosses.



SUNDSTRAND 60-IN. DOUBLE-END TURNING LATHE

The machine, shown turning a rear axle housing for an automobile in the illustration herewith, is designated as the Sundstrand double-end lathe. It is provided with two overhanging arms firmly supported by housings at both ends of the bed. The arms carry the two tailstocks and also support the center drive. It is claimed that the arrangement provides a greater adjustment of the tailstocks for various lengths of work, reduces the length of the bed for a given center distance and requires less floor space than would be necessary were the tailstocks clamped on the Vs of the bed. The tailstocks and center drive are placed close to the front of the machine. A ribbed and braced bed is provided, so constructed that the chips fall from the carriage into a pan furnished for that purpose.

The center drive is through gearing from the main drive shaft, which is provided at both ends with bronze bearings and extends through the entire length of the bed. At the end of the bed removable change gears connect the main drive shaft to another shaft geared to the center drive. The gears are all hardened and ground and those in the center drive housing run continually in a bath of oil.

The feed shaft, geared to the worm and wormwheels transmitting power to the front carriages, is driven from the center drive shaft by a sprocket and chain. Feed changes are made by means of removable change gears located at the end of the bed. The two sets of worms and wormwheels for the front carriages are made right- and left-handed, so that when the feed is thrown in the carriages work toward each other. The worms are submerged in oil, and to engage the feeds they are lifted into the wormwheels by handles. The wormwheels are keyed on the shafts that drive the carriages. On each pinion or wormwheel shaft is a handwheel 15½ in. in diameter. The tripping mechanism consists of a dog on each carriage which trips the feed lever and automatically disengages the worm from the wormwheel, at the same time disengaging the rear tools.

The front carriages are mounted directly over the front V of the bed. Each carriage is 18 in. long with a full length bearing surface on an 8 in. face at the front of the bed, and a 4 in. angular surface on the front of the V. An angular gib is provided at the bottom of each carriage to take up wear. Stop screws

are provided underneath the front tool slides.

The rear tool slides have wide bearings and are driven by means of a rack and pinion. They operate simultaneously with the front carriages. Independent feeds are obtained by means of removable change gears at the back of the machine. T-slots for longitudinal adjustment are provided, which permit the rear tools to be placed in different positions to suit the work. Single toolholders for the front carriages come as regular equipment. Multiple toolholders for front carriages and rear tool slides can be made to order.

The drive pulley is 18 in. in diameter for a 5-in. belt and runs on roller bearings. When arranged for motor drive the motor is mounted on a bracket below and to the rear of the drive pulley. A 10-hp. motor running at 900 r.p.m. is recommended by the manufacturer.

An oil pump of 2¼ gal. per min. capacity is part of the regular equipment. The tank for the cutting coolant is located directly below the pump in the base.

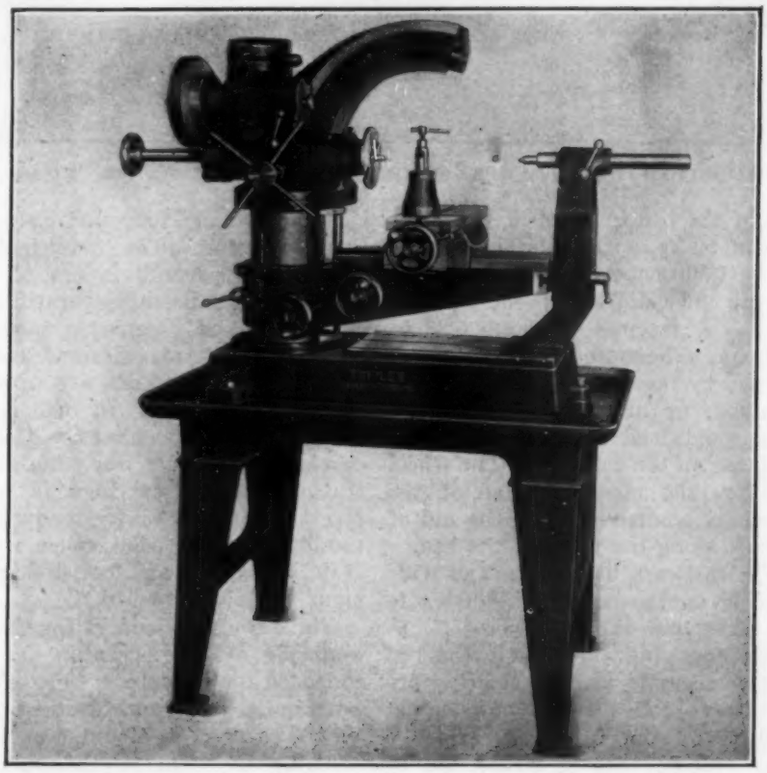
The lathes are furnished in two sizes, 36 and 60 in. The former occupies a floor space of 42x87 in., is 62 in. in height and weighs 5,100 lb. The latter occupies a floor space of 42x105 in., has the same over-all height, and weighs 5,500 pounds.

Triplex Floor-Type Improved Combination Machine Tool

The combination bench machine, described on page 898, Vol. 55 of *American Machinist* and built by the Triplex Machine Tool Corporation, 18 East 41st St., New York, N. Y., has been improved in construction and can now be provided with a floor stand. The machine is shown in the accompanying illustration mounted on its floor stand, which can be removed if the machine is desired on a wooden bench. A chip pan is also provided.

The distance between centers and the swing over the carriage have been increased from 11 to 14 in. and from 8 to 10 in., respectively with a corresponding increase in weight to 535 lb. Also, S.K.F. radial ball bearings are now used instead of bronze in mounting the change gear shafts.

The motor has its starting box mounted as shown in the illustration and its maximum speed has been reduced from 1,150 to 1,050 r.p.m. The minimum speed of 90 r.p.m. is still retained. Other minor changes have been made in the design of the machine. The machines are manufactured in the shops of the B. C. Ames Co., Waltham, Mass., with which firm the Triplex company is affiliated.

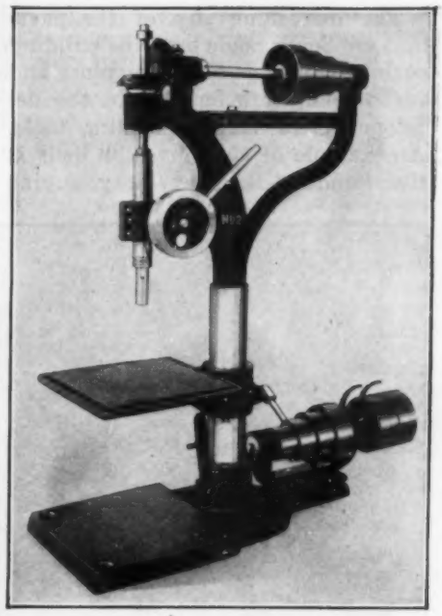


TRIPLEX FLOOR-TYPE IMPROVED COMBINATION MACHINE TOOL

Burke No. 2 Heavy-Duty Bench Drilling Machine

The Burke Machine Tool Co., Conneaut, Ohio, has recently placed on the market the heavy-duty bench drilling machine that is shown in the accompanying illustration.

The frame is cast in one piece and has a base that is planed off so that it may be used as a table when the regular adjustable table is moved to one side. The adjustable table is 10 x 10 in. inside the oil channels, has a vertical travel of 10¾ in. and can be swung around the column. A column 3 in. in diameter that is braced to give rigidity under heavy loads, is provided.



BURKE NO. 2 BENCH DRILLING MACHINE

The spindle is ¾-in. in diameter and has a ball thrust bearing. It has a fiber collar under the adjusting nuts. A No. 1 Morse taper hole is regularly employed, although a No. 2 taper can be furnished. The drift hole is below the sleeve, which has a bearing that is split for take-up. A vertical travel of 4 in. is provided for the spindle, the maximum distances of which from the base and table are, respectively, 18¼ and 10¾ in. The stop gage is at the top of the spindle.

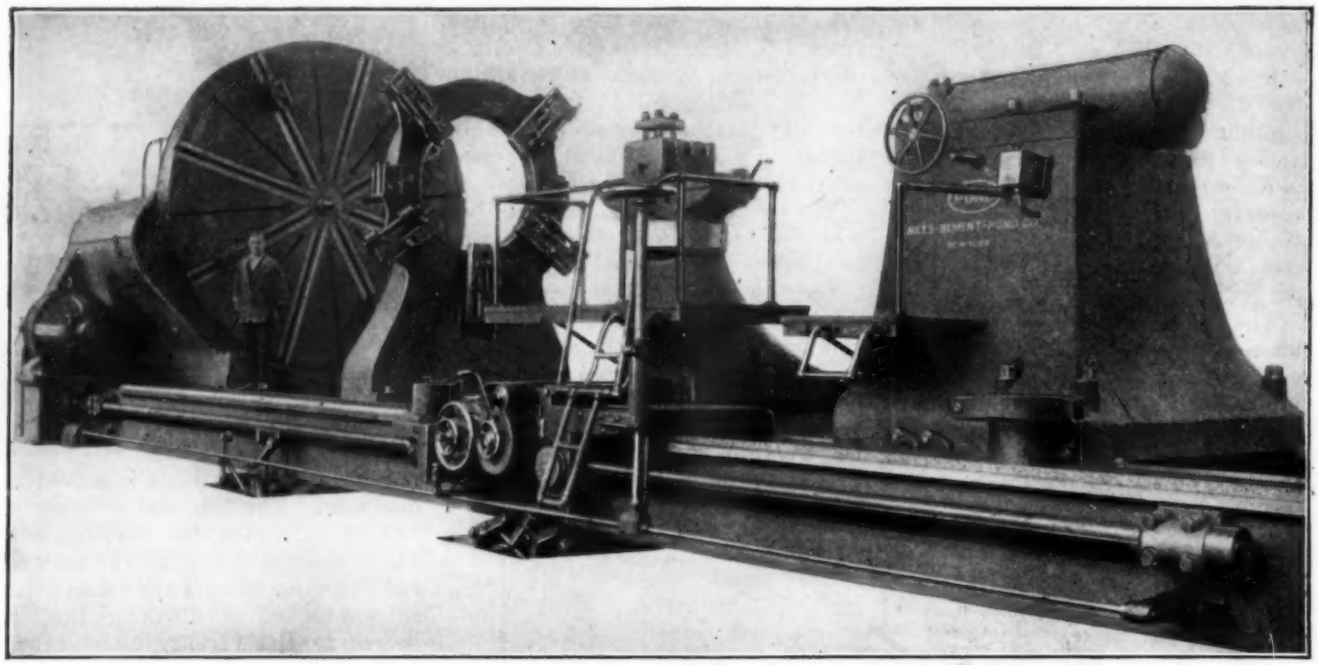
A tight and loose pulley type of countershaft is attached. The pulleys are 5 in. in diameter and are run at 500 r.p.m. or faster. Four-step cone pulleys running between two bearings transmit the motion from the countershaft to the gears. Spiral cut miter gears with generated teeth are used. To take up wear, the gears have fiber thrust collars under

them. The cone and drive pulleys are provided, respectively, with 1¼ and 2 in. belts. All bearings are of bronze with deep oil collars and wick feeders, and a bronze bushing is provided for the loose pulley.

The machine occupies a space of 32 x 12 in., has a height of 39 in. and weighs 170 lbs. Its drilling capacity ranges up to ⅞ in. and work up to 12 in. in diameter can be drilled in the center.

Niles-Bement-Pond 14-Foot Heavy Engine Lathe

The increasing size of the parts that are being made by firms building such machines as steam turbines and turbo-generators has led to the development of larger machine tools. An example of such machine tools is the Pond 14-ft. heavy-duty engine lathe recently built by the Niles-Bement-Pond Co., 111 Broadway, New York, N. Y.



NILES-BEMENT-POND 14-FOOT HEAVY-DUTY ENGINE LATHE

The lathe, shown in the accompanying illustration, has a bed 11 ft. wide and 50 ft. long. Its faceplate is 12 ft. in diameter. Although rated as a 14-ft. swing, it swings 14 ft. 6 in. over the bed and 11 ft. 6 in. over the carriage with the removable track for the tool carriage in place. When the section is removed the swing is 12 ft. 9 in. The maximum distance between centers is 34 feet.

The headstock is a large casting with all its bearings lined with bronze and scraped to fit the shafts, which are ground to size. The driving gears are mounted in the headstock and give the main spindle four quick mechanical changes of speed. The changes are made by means of levers located on the head within easy reach of the operator. All the bearings and gears are oiled from sight-feed cups.

The d.c. driving motor for the headstock is mounted on an extension of the bed in front of the head. It is of 50 hp. with a speed range of 500 to 1,500 r.p.m., and with the aid of the mechanical speed changes drives the faceplate at from 0.23 to 24 r.p.m. The motor may be started, stopped by means of dynamic brake, reversed, or any speed within its range obtained by a handwheel mounted on the carriage. The wheel operates the master switch of the automatic controller with the aid of a shaft along the front of the bed.

The tailstock has a long and wide bearing on the bed. In addition to the eight base clamping bolts, it has pawls engaging ratchets in the bed to give security against shifting under heavy end thrusts. The upper portion of the tailstock carries a steel spindle that is adjustable by means of a handwheel located close to the end of the tailstock nearest the work. The upper part also has a screw cross-adjustment for obtaining tapers of small angle. The upper member is secured to the base by bolts that are independent of the base clamping bolts, and therefore, cross adjustment is possible without danger of slipping, although the work may be between the centers. A power traverse along the bed is provided for the tailstock by a reversible motor which drives gears engaging the feed rack in the bed.

The tool carriage extends entirely across the bed and has a central depression in which the removable track is fitted. Mounted on the carriage is a long cross slide which carries a swiveling compound guide for the tool slide. The manufacturer claims this permits tapers of considerable length to be turned without the use of a separate taper attachment. Lateral, cross and angular power and hand feeds are provided for the tool slides. An independent motor and controller mounted on the carriage is used for the rapid traverse of the carriage in either direction. A five-jaw steadyrest is usually furnished, but roller steadyrests, back rests and tool slide extensions can be furnished.

Platforms and ladders for the convenience of the operator are provided on the headstock, tailstock and carriage. The motor control wheel on the carriage is mounted on a telescoping shaft to permit operation from the platform or the floor.

News Section

Annual Meeting of Export Managers' Club Is Held

Much enthusiasm and a most interesting program were the two salient features of the annual get-together meeting of the export managers of New York that was held at the Hotel Pennsylvania on March 20. Many excellent talks were listened to and there were many instructive discussions on a variety of subjects.

After registration the first session was called at ten o'clock at which C. J. Warren, foreign sales manager for the Remington Typewriter Co., presided as chairman. An address of welcome was given by H. P. Rockwell, first vice-president, Yawman & Erbe Manufacturing Co., which was followed by a speech by Thomas W. Pelham, director of sales, Gillette Safety Razor Co., on "Getting Results from the Sales Budget." H. L. Gemberling, director of foreign sales for the Sherwin-Williams Co., spoke on "Building Sales Through Service" and Ernest B. Filsinger, export manager for Lawrence & Co., took up the discussion of "Manufacturers' Representative or Merchant Distributor?"

In the afternoon "Practical Problems of Marine Insurance" were discussed by Peter Moora, export manager of the Patton-Pitcairn Division of the Pittsburgh Plate Glass Co. and L. R. Browne, credit manager of the International Western Electric Co. spoke on "Discounting Drafts vs. Collections" and there was a round table discussion on the standardizations of practice.

An informal dinner in the evening closed the meeting and it was generally voiced that it had been the most successful meeting so far held by the club.

Miller Speaks at Welding Society Meeting

S. W. Miller of the Union Carbide & Carbon Research Laboratory spoke on "Welding of Unfired Pressure Vessels" before the Metropolitan section of the American Welding Society, at the Engineering Societies Bldg., New York City, Mar. 20. The talk was informal and dealt with the code that is being tentatively adopted by the government regarding the welding of unfired pressure vessels. The code has three specific points, namely, that only double-V welds will be allowed, that all restrictions regarding the contents, pressure and uses of the vessels are taken off and that a standard test must be performed on the welded section. The test consists of running the pressure up to 1½ times the working pressure and then increasing the pressure to 3 times the working pressure and holding it there for 3 min. The complete report of the code committee is being published in the next issue of the Journal of the American Welding Society.

A brief discussion of recent developments in thin cast iron welding by electric-arc methods was given by C. J. Holslog of the Electric Arc Cutting and Welding Co. He spoke of the rapid advances made in welding thin sections during the past two years and stressed the point that no fear should be had in performing work of this kind under proper supervision.

Chicago Pneumatic Tool Profits Increase

The 1922 report of the Chicago Pneumatic Tool Co., New York City, shows a net income of $567,525 after deducting depreciation, Federal taxes and accruing renewals. The net income in 1921 was $158,107. The net balance for the capital stock was $505,818, after adding for income and deducting interest and other fixed charges. The amount for 1921 was $118,363.

Net current assets according to the general balance sheet for December 31, 1922, were $9,496,106, and net current liabilities were $1,956,697.

The improvement was due to better business during the latter half of the year, as the company suffered during the first half of the year from the general business depression.

U. S. Steel Reports Big Annual Earnings

Gross business for the year 1922 totalled more than a billion dollars, according to the annual report recently issued by the United States Steel Corp. which is characterized in the daily papers as the largest industrial organization in the country. The report shows that $1,092,697,722 represented the gross which compares with $986,749,719 grossed during 1921. The net income reported amounts to $58,840,801 and, after the usual charges are paid, is equivalent to $2.84 a share on the common stock outstanding. This compares with $2.24 in 1921 and with $16.62 paid in 1920.

The company reports that its domestic sales increased 14.83 per cent during last year and its import sales increased 18.42 per cent. While the prices received for the products were less last year than during the previous two years business was improved and earnings were more in proportion.

The report shows that the total assets of the corporation amount to $2,340,653,216. This amount is divided between plant, equipment, accounts receivable, United States bonds owned and other securities held.

It was announced by Elbert H. Gary, chairman of the board of directors, that the corporation expects to spend sixty-five million dollars for improvements during the coming year.

Association is Formed to Perfect Industrial Personnel Work

Nearly two hundred executives, representing industrial and commercial enterprises in all parts of the country, met at a management conference at the Bankers' Club of America, 120 Broadway, March 14, and brought into being the American Management Association.

The new organization takes the place of the National Personnel Association, and, according to an announcement made by the board of directors, will be "devoted exclusively to the consideration of the human factor in commerce and industry." Responsibility for the solution of problems bound up in personnel work was put squarely up to management.

The officers of the new American Management Association are: president, W. W. Kincaid, president of the Spirella Co., Niagara Falls, N. Y.; vice-presidents, Sam A. Lewisohn, New York, vice-president of the Miami Copper Co.; John A. Stevenson, vice-president of the Equitable Life Assurance Society of the United States, New York; and Fred W. Tasney, vice-president of the Prudential Insurance Co. of America, Newark, N. J.

The directors include: Elisha Lee, vice-president of the Pennsylvania Railroad Co.; E. K. Hall, vice-president of the American Telephone and Telegraph Co.; C. R. Dooley, manager of personnel and training, Standard Oil Co. of New Jersey; Percy S. Straus, vice-president of R. H. Macy & Co., Inc.; Arthur H. Young, manager of industrial relations, International Harvester Co.; C. S. Ching, supervisor of industrial relations, United States Rubber Co.; Henry S. Dennison, president of the Dennison Manufacturing Co.; Miss Louise Moore, employment service manager, Dutchess Manufacturing Co.; John McLeod, assistant to the president, Carnegie Steel Co.; Dr. R. S. Quinby, service manager, Hood Rubber Co.; and S. B. Bunker, advisory staff, industrial relations division, General Motors Corp.

New York to Give Industrial Scholarships

The State of New York is offering twenty-five industrial teachers' scholarships of $1,000 each to qualified trade and technically trained men. Persons selected to hold these scholarships will spend one year at the Buffalo State Normal School preparing to teach their subjects in the public vocational schools of the State. The satisfactory completion of the one year course by scholarship holders will entitle them to secure a life license to teach a specific trade, industrial or technical occupation. The annual salaries paid vocational teachers now range from $1,800 to $3,500 after a period of experience.

Machine Tool Business Good in St. Louis

A meeting of the St. Louis Branch of the National Metal Trades Assn. was held recently. About fifty members of all branches of the trade were present and a survey of the situation both for the past year and for the future was discussed. The ground for this survey had already been covered by a questionnaire submitted to the members by the secretary of the branch, John F. Hem.

At the present time the machinery industry generally and the machine tool trade in particular is enjoying a healthy business. This is due to several causes not least among them being the active buying which railroads are doing to equip new shops and augment their present supplies to take care of the large amount of repair work they are doing. Large numbers of freight cars that have been lying idle because of the lack of necessary repairs are being put into commission by the various lines. The St. Louis & San Francisco and the Missouri Pacific roads are building shops to the south and west of here which will necessitate the installation of new machinery. This is having its effect on the industry at the moment.

The Medart Mfg. Co. which supplies the overhead transmission for power machinery is doing an excellent business and has been doing so since Dec. 1. The condition of this company is indicative of the state of affairs with the manufacturers of machine tools inasmuch as its line of equipment calls for the installation of machinery immediately.

Among the large orders which the Medart Co. has handled lately has been that of the Atlas Tack Mfg. Co. with headquarters at Boston, Mass. This company is erecting a large plant here in the section of the city known locally as "the new industrial center." This lies in the northwest portion of St. Louis. The order which the Medart Co. received approximated six thousand dollars. The machinery which the Atlas Co. uses is of a special type and will probably be manufactured in the east and shipped here.

Railroads Buying Machine Tools and Cars

The Carolina, Clinchfield & Ohio Railway Co. has applied to the Interstate Commerce Commission for authority to assume obligation for $500,000 of 5½ per cent equipment trust certificates proceeds from the sale of which are to be used for rebuilding 10 Mallet type locomotives.

A twelve million dollar contract for the construction of 330 miles of railroad was signed in New York recently by a firm of Omaha contractors. The road is to extend from Casper, Wyo., to Miles City, Mont., via Sheridan, and is to be operated by the Middle States Oil Co. Work will begin April 1.

The Association of Railway Electrical Engineers will not hold a semi-annual meeting this year, but the regular annual convention will be held in Chicago in October.

The Elgin, Joliet & Eastern Ry., reported as recently having purchased 10 Mikado type locomotives, has entered the market for five additional locomotives of this type.

The Sorocabana Railroad is said to be in the market for 10 Mikado type locomotives. This railroad is located in Brazil.

The Belt Railway of Chicago is said to be in the market for 5 eight-wheel switching locomotives.

The Louisville & Nashville Railroad has issued inquiries for 4,000 55-ton hopper cars, 2,000 55-ton composite gondola cars and 2,000 box cars.

The Pennsylvania Railroad is reported to be in the market for a considerable quantity of pressed steel parts for freight cars under construction in its own shops.

The Texas Co. is reported to be inquiring for 500 tank cars.

The Emmons Coal Mining Co., Philadelphia, is reported to be in the market for 300 70-ton and 200 50-ton hopper cars.

The Toledo, St. Louis & Western Ry. is inquiring for 100 flat cars of 50 tons capacity.

The Carnegie Steel Co. is inquiring for 20 gondola cars of 50 tons capacity and 20 gondola cars of 70 tons capacity.

A new bridge over the Missouri River at Blair, Neb., is planned by the C. & NW. Ry. The bridge is 1,000 feet long.

Extension and construction of grain elevators and enlargement of shops at Port Arthur involving $1,100,000 is contemplated by the Kansas City Southern Railroad, according to Chairman Loree of the company. An extension of six miles into zinc mine fields of Oklahoma is proposed. Included in this program is the enlargement of the company's shops at Pittsburg, Okla., which will entail expenditures amounting to $6,000.

A new line 16 miles long is to be constructed by the Burlington Railroad between Frederick, Ill., and Vermont, Ill. Approximate cost of the work will be $1,800,000.

A.S.M.E. Seeks Postponement of N. Y. Registration Law

The American Society of Mechanical Engineers is attempting to obtain a postponement of the law in New York State requiring the registration of all engineers in the state by May 5, 1923. The New York membership of the Society is being circularized to learn the opinions of mechanical engineers on the various phases of the law. This action has been taken as a result of a report from a Special Committee on Registration of Mechanical Engineers in New York State consisting of P. Junkersfeld, Chairman, A. G. Pratt, and John M. Goodell.

London Machinery Exhibition

Arrangements are being made for the big shipping, engineering and machinery exhibition to be held at Olympia, London, Aug. 31 to Sept. 22. The general manager of the exhibition has sent out invitations to many of the engineers and machine tool makers in the United States and says in his letter that a visit to the British Consul will impress upon those interested the importance of this affair. F. W. Bridges of Avenue Chambers, 4 Vernon Place, Southampton Row, W. C. 1, is general manager.

Many Milwaukee Machine Factories Busy

A moderately active market for machine tools and machinery is reported by Milwaukee manufacturers and dealers of toolroom as well as floor equipment for metal and wood working plants. The prospects are deemed especially favorable, and while all elements of the trade continue to refrain strictly from speculation over the definite value of the outlook, it is a fact that more and more shops and factories are reaching the point where it is necessary to undertake enlargement, with the consequent purchase of equipment, in order to meet current demand adequately and promptly. For the past two years the bulk of business has been confined to replacements of obsolete, worn-out or inefficient tools with modern, multi-purpose and high production designs, rather than to provide for any substantial extensions of capacity. The tendency to be conservative in expansion programs remains existant, lest the unfortunate experiences of the period immediately following the end of the war be repeated.

Night Shifts for Auto Industry

The automotive equipment division of the metalworking industries has been the outstanding feature of general manufacturing business in Milwaukee for the past year. Despite the fact that such works have been obliged to install night shifts and are now not able to cope with contract delivery specifications, the disposition is to proceed slowly with construction and equipment of additions, to avoid possible over-expansion. Consequently, while there is a steady call for tools and machinery, it is largely to increase production efficiency or to make replacements.

The passenger automobile industry in Milwaukee has undergone material enlargement since Jan. 1 by the transfer of the works of the LaFayette Motors Corp. from Indianapolis to Milwaukee, and the erection of additions increasing the capacity of the Nash Motors Co. four-cylinder car division at Milwaukee by 100 per cent. Both interests have completed the purchase of the major requirements of tools and machinery, but are piecing out equipment from time to time by the purchase of single items of a miscellaneous character.

Other Wisconsin Factories

The Kissel Motor Car Co., Hartford, Wis., is proceeding with a new power plant project and the general going over of plant for increased production without material enlargement of either buildings or equipment. The Chevrolet division of General Motors Corp. is completing purchases of equipment for its new passenger car works and body plant at Janesville, Wis., which represents not only a conversion of the large works originally built for the Samson Tractor Co., now liquidated, but also extensive new construction which is ready for machinery and equipment.

Manufacturers of milling machines are able to maintain production varying from 30 to 45 per cent of capacity on orders, mainly for multi-purpose tools from the automobile industry. New business is being booked in a moderate way, but requires no steady increase in working forces.

Trans-Atlantic Freight Rate Reduction to Aid Exporting

Recent reductions in trans-Atlantic freight rates on heavy-lift shipments range from 25 per cent on parcels weighing under 2 tons to as much as 57½ per cent on parcels weighing 7 to 10 tons, according to *Commerce Reports* of the Department of Foreign and Domestic Commerce.

In the belief that reduced transportation costs will materially improve the chances of selling heavy machinery and industrial equipment of American make in the British market, the American Chamber of Commerce in London is writing the following letter to every important manufacturer of machinery in the United States:

A substantial market existed in this country before the war for many special lines of imported machinery. Current price details of certain American and German machinery seem to indicate that the recent collapse of the mark has already forced German costs of production and export prices to so high a level that the market prospects for American machinery in this country would appear to have benefited proportionately, particularly as general confidence and financial conditions here are at last improving.

The shipping lines which are interested in the movement of American goods to this country are also doing their bit to encourage this tendency toward improvement, and we understand that north Atlantic freight rates are being sharply reduced, particularly with regard to heavy and bulkly packages, in which direction a special effort is being made to encourage traffic by relieving traders of the expense of knocking down and setting up. We are informed that there have recently been added to the North Atlantic services a number of new freighters with exceptionally powerful derrick equipment designed for the purpose of handling these heavy weights.

With a view to investigating the possibilities of this market and at the same time to lose no opportunity of stimulating trade, this chamber of commerce is assembling, for purposes of comparison, all the figures that can be obtained with regard to current prices for various kinds of continental machinery, particularly German, and to assist us in determining intelligently whether there is actually a good market for American machinery at the present time. We would be glad if you would let us have whatever information you may feel free to give, along the following lines: (*a*) Details of American prices f.o.b. any United States Atlantic port; (*b*) packing lists or specifications of specimen plants, giving particulars which would include weight and measurement of each package.

After correlating and surveying these details we shall be glad to advise you to the best of our ability whether or not it would seem worth your while to attempt to enter this field with your product, assuming that you are not already operating here, and that you are interested in our work along these lines.

Further, if you should desire, we would be glad to try to put you in touch with suitable agents or representatives to look after your interests here.

The object of this chamber, of course, is to promote the greatest possible amount of business between the United States and this country, and we will hope to have your assistance along the lines described above, for if this effort is to be successful it will require the active co-operation of all who are interested.

It is an interesting attempt to stimulate trade at a time when the prospects of larger demand for American machinery are growing brighter than they have been before for many months. For a good many manufacturers, of course, the British market offers little or no real chance for business in the near future, or ever. For others, on the contrary, the ultimate possibilities appear good. The efforts of the chamber of commerce, if properly met by American manufacturers, should help to interest those who have some real chance of developing a market in this country.

American Brake Shoe to Build Two Plants

Accompanying the annual statement of the American Brake Shoe & Foundry Co. recently made in which the company was shown to be in a most prosperous condition, was the statement that within the year two new branches would be built, one at Houston, Texas and the other at Portsmouth, Va. According to Joseph B. Terbell, president of the company, the factories will be completed by July 1.

The annual report showed that during 1922 the company had a net profit of $2,120,539 which is the equivalent after dividends on subsidiary stocks and preferred shares have been paid to $9.60 a share on the outstanding 151,238 shares of no par common shares. This compares with a profit of $1,320,271 and a common stock dividend of $4.41 in 1921.

Three Concerns in Wells Corporation Merger

The Wells Corp. has been formed in Greenfield, Mass., as a holding company for the consolidation of metal and small tool industries. It has acquired the American Tap and Die Corp. and the F. O. Wells Co. in Greenfield and the Williamsburg Manufacturing Co. in Williamsburg, Mass. Frank O. Wells, who for nearly fifty years has been interested in the tap and die business, is president and chairman of the board of directors of the new concern. Associated with him as directors are Louis E. Peck, Albert B. Allen, William B. Kieth and W. S. Howe of Greenfield; Graydon Stetson of Boston, J. Lyman Pratt and Frederick L. Putnam of New York. The plants produce a varied line of products consisting of standard taps and dies, tap and drill grinders, screwplates, counterbores, levels, tool sets, screw drivers, butchers' cutlery, and so forth.

Machine Tool Business in San Francisco District

The machine tool situation in the San Francisco district is somewhat less active than in the south, largely because of the oil boom in that section of the state. Business is moving along quite satisfactorily, however, and there has been considerable growth toward real manufacturing during the past three years. One radio concern, which has moved to Oakland in order to get more room, has achieved a national reputation and ships carloads of its products east of the Mississippi River.

The large tractor business is good—more on account of road building than farming—just at present. But the output is so good as to demand better manufacturing methods which has led to the design of several large, special machines. Heat treating departments have been extended in a number of the shops and the most modern equipment has been installed for controlling temperature in carbonizing and in hardening. Grinding of parts has also increased. In automobile repair work the cylinder grinding machine is now part of the equipment in almost every service station.

Motor Buses and Machine Tools

The two large assembling plants for Chevrolet and Durant cars have added considerably to the activities of the towns across the bay, which are in fact becoming industrial centers of growing importance. The steady increase in motor bus traffic is helping to build up a line of business which may result in real manufacturing a little later. The requirements of bus transportation are being carefully studied, and both the chassis and bodies are being developed to meet the needs of this industry. The makeshifts of the past are gradually becoming comfortable conveyances. Buses are run between Los Angeles and San Francisco with three relays of drives, a distance of over 450 miles.

There is a little manufacturing of automotive parts, and it seems to be growing. It now includes piston pins, bearings, valve cages, clutch plates, transmission shafts and gears and many other parts for replacement purposes. There is also a well known motor made in fair quantities, across the bay. Special transmissions and rear axle gearing are made and gear cutting shops keep busy on a large variety of work.

High duty turbines for hydro-electric work have been largely developed in San Francisco and much work of this kind is now under way for the Hetch Hetchy and other projects. So, while there is no boom due to oil or mining, the business outlook is very encouraging and dealers report improvement all along the line.

The total yearly volume of business in machine tools done from San Francisco as a center is not easy to estimate. Opinions differ widely, occasionally influenced, probably, by a desire to offset the boom business in the south. As a guess it would seem that $1,500,000 to $2,000,000 was a conservative estimate, with a probability that a good year of normal business will easily bring it to the upper figure. And it is well to remember that this makes up a total of from $4,000,000 to $4,500,000 for machine tools in California alone.

The Business Barometer

This Week's Outlook in Commerce, Finance, Agriculture and Industry Based on Current Developments

By THEODORE H. PRICE
Editor, *Commerce and Finance*, New York

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EVERY ONE IS optimistic and every report and forecast published is cheerful, both as to the present and the future.

It is therefore unnecessary to amplify upon the weeks news of activity and prosperity. Iron is up $1.00 a ton. The demand for steel exceeds the output which is still limited by the labor scarcity. Copper is now selling at 17½ cents. The far-sighted action of the American Woolen Co. in voluntarily raising its employees' wages by 12½ per cent indicates an expectation of good business throughout the Summer and probably insures the higher wages demanded by the operatives in the New England Cotton Mills. Wheat has been firmer than for some time and many believe that all the cereals are destined to sell higher. Cotton goods are in excellent demand and although cotton futures are a shade easier the inherent strength of the statistical position is relied upon to prevent any serious decline.

Rubber, coffee and jute have declined slightly because either our own Government or another has issued some report or taken some action whose effect has been to make buyers hesitant.

The East India Government, for instance, has discovered that its earlier estimate of the jute crop was too small. The Brazilian Government is said to have been selling the unsold remnant of the coffee it held, and the advance in rubber has been checked by the outgivings of some Washington Bureau whose officials seem to think that a nation which protects its own producers, as does the United States, has the right to challenge Great Britain for pursuing a similar policy in protecting the rubber planters within the British Empire.

But these surface changes in the markets have not reduced the volume of business in this country which is so large that it taxes the capacity of the railroads to the utmost and is swelling their net revenue to record figures.

With such a background it is surprising that the security market has not showed more buoyancy and that it has in fact been distinctly slack. Liberty Bonds have been drooping. They have touched the lowest figures of the calendar year, and the bond market generally has been heavy while stocks, though active, are in many cases lower than a week ago.

This incongruity between the condition of commerce and that of finance cannot be attributed to any lack of lendable capital, for the weekly statement of the Federal Reserve System shows a slight increase in the reserve ratio, which now stands at 75.7 per cent as compared with 75.4 per cent a week ago.

The gold held shows a decrease of $4,000,000, it is true and the bills held have increased by about $30,000,000, but the expansion still possible runs into the billions and any advance in the rediscount rate would be vigorously resented as without warrant.

We must therefore look elsewhere for an explanation of the persistant apathy of the financial markets if we admit the generally accepted theory that the shadows of coming events are earlier visible on the stock exchange than in the marts of trade.

This theory has been so often vindicated that it hardly needs verification, but as bearing upon it the history of the comparatively recent past is at least interesting. In the winter of 1920 the commercial markets were much as they are now. Prices were high, everyone was cheerful and a summer of great commercial activity was anticipated. But the stock market was lethargic until it commenced to give way in February, when a decline in silk caused the suspension of some important Japanese Banks and was followed by the collapse of the Ryan Corner in the stock of the Stutz Motor Co.

> "But these surface changes in the markets have not reduced the volume of business in this country which is so large that it taxes the capacity of the railroads to the utmost and is swelling their net revenue to record figures. With such a background, it is surprising that the security market has not showed more bouyancy and that it has in fact been distinctly slack. Liberty bonds have been drooping and touched the lowest figures of the calendar year."

But these events, which proved to be the bells that rung down the curtain of the post war boom, were unheeded in the commercial markets where activity persisted even after Wanamaker's famous cut in prices showed that he had taken alarm.

Attention is now called to this record because it suggests a slight analogy between the past and present. The stock market is again lethargic and another corner in a speculatively exploited stock, that of the Piggly Wiggly Co., collapsed last week.

There have been no failures in Japan, but the near war in the Ruhr becomes daliy nearer real war despite the optimism of some newspaper correspondents.

Philip Snowden the ablest leader of the Socialist Labor party in Great Britain has introduced a bill in parliament that contemplates an abandonment of the Capitalistic System and the right of private ownership in land in England. There is no likelihood that the bill will be passed now, but the support it has received and the seriousness with which it is being considered show that there has been an amazing change in the political philosophy of the British masses.

In addition to all this and even more important perhaps in their bearing upon the immediate future of American business are the scarcity of labor and the demand for higher wages that are being made and granted. As a result Secretary Hoover has advised that the Government should suspend all unnecessary building for a time and the Federal Reserve Board has instructed that the various Federal Reserve Banks shall likewise defer any building operations that can be postponed.
other industries.

Labor Scarcity Feared in Chicago

The demand for iron and steel continues heavy with prices showing an advancing tendency, and sales of good sized tonnages are reported daily. Advances in steel warehouse prices, particularly on sheets, are expected due to higher mill quotations in the Eastern market. Structural steel, plate and sheet demand is active. Specifications against current contracts is equally as heavy as in recent weeks. Reaction in scrap prices is expected during the next few weeks.

The buying of machine tools is not confined to any particular industry, but a majority of purchases are being made by railroads and automotive manufacturers. Sales continue in fair volume.

Steel mills in the Calumet-Gary sector are booked almost solidly for the second quarter of the year. By the end of this month it is expected that all merchant stacks in the Chicago district will be in operation.

Car building is less active with only 3,800 freight cars bought during the week; but the railroads are to stand $700,000,000 for improvements in 1923. New building operations are marking time awaiting warmer weather, but the number of permits issued forecast record-breaking activity in a few weeks. The average number of hours worked in machine shops in the Chicago district is 53 per week, approximately twice the average for the same period last year.

The metal trades started the month with 5 per cent more men than on Feb. 1. Agricultural implement factories registered the greatest increase, a growth of 24 per cent in the number of workers in 22 plants. Six hundred and seventy-five Chicago employers reported to the Illinois Department of Labor that there were 10,000 more persons at work March 1 than on Feb. 1. The labor scarcity which first manifested itself in the steel mills, nearly a year ago, is rapidly spreading into other industries such as foundries and metal-working plants.

Personals

Joseph T. Ryerson & Son, Inc., with main plant and offices in Chicago, has purchased the plant, stock and good will of the Cincinnati Iron & Steel Co., Cincinnati, Ohio.

The Ryerson Co. will now have six steel-service plants, located at Chicago, St. Louis, Detroit, Buffalo, New York and Cincinnati.

LEWIS E. SKINNER

The plant of the Cincinnati Iron & Steel Co. occupies a full city block at Front and Freemont Sts.

Cutting and handling facilities will be improved to make possible a twenty-four-hour shipping schedule.

The plant is well located for fast truck deliveries and is near the bridges for Kentucky shipment. Two loading tracks of the Baltimore & Ohio Railroad traverse the plant, greatly increasing the speed with which out-of-town orders may be handled.

Lewis E. Skinner, who is well known in steel circles, through his eighteen years with the Ryerson Co., now has charge of the plant. Mr. Skinner will be assisted by C. A. Parnell, former assistant to Arthur Allshul, at the Ryerson Buffalo Plant.

CLIFFORD F. MESSINGER, member of the board of directors and for the past three years general sales manager of the Chain Belt Co., Milwaukee, was elected second vice-president at the annual meeting held recently. Mr. Massinger is also a director of the Interstate Drop Forge Co., Milwaukee.

JAMES R. MORASH, for twenty years connected with the executive staff of the General Electric Co., has been elected secretary and appointed general manager of the Lipman Refrigerator Car and Manufacturing Co., Beloit, Wis.

HARRY T. SCOTT, formerly sales manager of the Detroit Twist Drill Co., has resigned to become New England representative of the Whitman & Barnes Manufacturing Co., Akron, Ohio, maker of twist drills and reamers. His headquarters will be at Hartford, Conn.

The Whitman & Barnes Manufacturing Co. will transfer its New York office and warehouse on May 1 from 64 Reade St. to 99 Chambers St.

FRED K. CORDES recently joined the Western Drop Forge Co., Marion, Ind. Mr. Cordes was formerly with the J. H. Williams & Co., Brooklyn.

F. W. DAVIS will have charge of cost accounting at the Western Drop Forge Co., Marion, Ind. He was formerly with J. H. Williams & Co., Brooklyn.

BRACE, MUELLER & HUNTLEY, INC., Buffalo and Syracuse, has been appointed distributing agents for the Atlas Steel Corp., Dunkirk, N. Y., for New York state west of Schenectady.

PAUL A. COLLINS, formerly Washington representative for the Automatic Electric Co., has been appointed assistant manager of the P. A. X. department of the North Electric Manufacturing Co., Galion, Ohio, maker of private automatic interoffice telephone exchanges and machine switching systems for city telephone exchanges.

JOHN G. BAUKAT, founder and president of the Batavia Car Works, Inc., Batavia, N. Y., has resigned from the board of directors and will retire from active business.

MICHAEL F. MURPHY has retired after forty-five years as general master mechanic of the Lackawanna Steel Co., Lackawanna, N. Y.

LEON EHRMAN, foreman of the furnace department of the Cambria Steel Co., Johnstown, Pa., on April 1 becomes the superintendent of the Ironton Steel Co., Ironton, Ohio.

HAKON A. BERG has resigned as assistant general manager of the Cambria Steel Co., Johnstown, Pa., to become general manager of the Ironton Steel Co., Ironton, Ohio.

CHARLES F. LEDERER has been appointed general supervisor of rail welding for the Metal & Thermit Corp., New York, and will organize a corps of assistants.

ARNO GREINER, of the Singer Manufacturing Co., Elizabethport, N. J., has returned from six months in Europe.

H. PATTERSON HARRIS has accepted a position as assistant general manager of the Automatic Machine Co., Bridgeport, Conn.

WILLIAM E. JERAULD is assistant works manager at the Bridgeport, Conn., works of Manning, Maxwell & Moore, Inc.

CLAUDE HARTFORD, formerly with the Wilson Welder & Metals Company, Inc., is now connected with the New York Steam Corp. of New York City.

A. H. LANE has severed his connection with the Cohoes Iron Foundry & Machine Co. to become Eastern sales engineer for the Warsaw Elevator Co.

J. S. MARLOWE has been appointed district sales manager in the Indianapolis District with offices in the Roosevelt Building, Indianapolis, for the Atlas Steel Corp., Dunkirk, N. Y.

ELMER E. YAKE, works manager of the Gilbert & Barker Manufacturing Co., was the speaker at the meeting of the Engineering Society of Western Massachusetts held recently at Springfield, Mass.

JOHN F. TUTTLE has been appointed auditor of the Brown-Lipe-Chapin Co., Syracuse, N. Y.

C. G. D'UGGLAS will have charge of the new Detroit office, Majestic Building, of the Williams, White & Co., of Moline, Ill.

W. G. MCCANN, export manager of the Hendee Manufacturing Co., Springfield, Mass., has returned from a five months' tour of Europe on business.

E. A. MERRILL has been elected president of the Minneapolis Steel & Machinery Co., Minneapolis, Minn., succeeding G. M. Gillette. Mr. Merrill has been vice-president and treasurer of the company and he will be succeeded by G. L. GILLETTE as vice-president and by CAL SIVRIGHT as treasurer of the concern.

C. A. THUMM, 125 Light St., Baltimore, Md., has been given the exclusive sales rights in the Baltimore territory by the Rockford Machine Tool Co., Rockford, Ill., for its machine tool products.

JOSEPH R. SHEPARD is an engineer in charge of the machinery department of the Florence, N. J., plant of R. D. Wood & Co. of Philadelphia.

JOHN S. MAKEMSON, formerly of the International Harvester Co. has been appointed zone manager of the Buick Motor Co. of Flint, Mich., and will be in charge of sales and service in the Port Huron district. Mr. Makemson for the past 10 years has been with the Columbus, Ohio, branch of the Harvester Company.

News of Activities in Washington

Schedules of information regarding costs of production will be sent domestic manufacturers by April 1 by the Tariff Commission in connection with investigation of commodities regarding which applications for changes in duty under the flexible tariff section have been filed, and which have reached the stage of field work.

Not later than May 1, the Commission will send four parties of experts and accountants abroad to investigate foreign costs of production of the same commodities. The flexible tariff section of the 1922 act provides that any change in duty recommended by the Tariff Commission to the President shall be to equalize costs of production between the domestic manufacturers and those of the principal competing country or countries. The Commission also will appoint a chief of its foreign staff in the near future, to open headquarters in either Paris or London and arrange for the visits of the various experts who will be sent to Europe from time to time. The Commission has several men in view for this post, the requirements being an economist who is familiar with the languages and customs of Europe.

SECRETARY WAINWRIGHT'S IDEA FOR INDUSTRIES

Every factory, every industrial establishment, must be induced to take peace-time steps to be prepared, in the event of an emergency, to get into its stride maximum production at the earliest possible moment. This point was stressed in a final report made by the retiring assistant Secretary of War, J. Mayhew Wainwright.

"The end to be sought," says Col. Wainwright, "is to insure that the production curve in each of the essential elements of supply shall meet the curve of the induction of man-power into service at the earliest point of time. It is of ominous import to know that in several essential features of the ordnance program, it will be many, far too many, months after the declaration of war before we can hope that the production curve shall meet the mobilization curve."

Obituary

ALFRED M. SHOOK, a retired capitalist and one of the pioneers in the development of the coal and iron industries of the South, and formerly connected in an executive capacity with the Tennessee Coal and Iron Co., and the Southern Iron Co., of Chattanooga, died recently at his home in Nashville, Tenn., at the age of 77 years.

EDWARD H. DEAN, aged 80 years, president of the Dean Brothers Pump Works, died recently at his home in Indianapolis. Mr. Dean was well known in industrial circles and also in the civic life of his city. He is survived by his wife, three sons and three daughters.

FREDERICK GROTENRATH, president of the American Machinery Co., Milwaukee, Wis., died at St. Mary's Hospital on March 15 at the age of 77 years. He was born in Germany and came to America with his parents as an infant, residing in Milwaukee over seventy-five years. The business was established in 1900 and is actively managed by his sons George, Fred and Edward.

A. L. PRYOR, who had been associated with the Kearney & Trecker Corp., Milwaukee, for nearly forty years, died recently after a three days' illness. Mr. Pryor was purchasing agent at the time of his death and was 61 years of age.

Business Items

The Nashville Blow Pipe & Equipment Co., Nashville, Tenn., manufacturer of steel smoke stacks, announces the moving of its Nashville plant to 810 Seventeenth Ave., North.

The Hanks Stove Foundry, Rome, Ga., has started the construction of an addition to its plant that will increase its capacity about 25 per cent. This is the second addition the company has built during the past few months.

The Chemical Engineering & Foundry Co. has been organized in Atlanta, Ga., by a group of business men, and has taken over the plant and properties in that city of the Pratt Engineering & Machine Co., planning to resume operations at the plant this month, according to E. Josephs, president and treasurer of the new company. The plant proper covers twelve acres of ground, and manufactures various types of special machinery, etc.

A machine shop to specialize in work of the printing trades has been opened by Charnock-Winegar, Inc., in Buffalo.

It is expected that two batteries of coke ovens with a capacity of 110,000 tons of coke annually will be built by the Bethlehem Steel Co. at its Lackawanna plant.

The Pittsburgh branch of the Metal & Thermit Corp., will be located at 1514 Fayette St. N. S. after May 1. The office is at the present located at 801-807 Hillsboro St., Corliss Station.

The Railway Motor Finance Corporation has incorporated under the laws of Illinois. It is intended to finance the needs of small railroads and others in the purchase of railway and express motor car equipment. At the first meeting of the corporation J. W. Cain, manager of purchases of the American Short-Line Railroad Association was elected president. A. C. Moore, vice-president of the Chicago Railway Equipment Co. and L. S. Case, president of the Waterloo, Cedar Falls & Northern Ry., were elected vice-presidents. A. M. Fornwald is secretary-treaurer. Offices of the corporation will be located temporarily at 616 Railway Exchange Building, Chicago.

The Stover Manufacturing & Engine Co., Freeport, Ill., reduced its stock from $1,500,000 to $1,355,100.

The two-story building at 846-48 West Eastman St., Chicago, was destroyed by fire with a loss of $250,000. It was occupied by Johnson-Carlson Co., wooden tank manufacturer and the Riviera Talking Machine Co. Officials of both companies reported stock, plant and machinery a total loss. They expect to resume operations.

The one-story frame building, Exchange Ave. and Dexter Park, Chicago, owned and occupied by Union Stock Yards & Transit Co., as machine shop, burned with considerable loss to contents.

The one-story frame building, 300 x 500 feet, at 4118 South Halsted St., Chicago, occupied by the Mercury Manufacturing Co., was destroyed with a loss of $250,000. This company manufacturers "trackless trains."

The Phenix Cheese Co., which is erecting a $100,000 cheese factory and warehouse at Plymouth, Wis., five stories, 60 x 130 ft., is in the market for a 30-ton ice machine, two 150 hp. boilers, engine, generator, etc. Contracts for building construction have been let. R. A. Harbach is general manager.

The Dry Milk Co., 15 Park Row, New York, N. Y., has awarded contracts for the erection of a new milk products plant estimated to cost $250,000 at Columbus, Wisconsin. Inquiry is being made for the entire equipment of factory and steam power plant by L. G. House, chief engineer.

The city of Madison, Wis., has taken final steps leading toward the commencement of actual construction work on a new sewage disposal plant, to be built in four units estimated to cost $250,000 each, the first to be ready July 1, 1924. Plans are being prepared by E. E. Parker, city engineer, and will be available to bidders about April 15.

The Holyoke (Mass.) Water Power Co. has awarded to the Edgemore Iron Works of Delaware a contract for a new watertube boiler of about 1,000 hp., the largest unit of its kind in that vicinity and the fifth boiler of that type to be installed for the company.

Lists have been sent out by the Mercer Motors Co., Trenton, N. J., announcing the sales of the surplus shop equipment. All descriptions of boring machines, milling machines, automatic machines, screw machines, turrets, lathes, drilling machines, grinders and motors are being offered.

Examination for the civil service position of assistant examiner at the Patent Office, Washington, D. C., has been announced for May 9, 10 and 11. Full information may be obtained by writing to the United States Civil Service Commission, Washington, D. C.

The Trindle Co., Milwaukee, Wis., has been organized with a capital stock of $125,000 by John C. Trindle and associates to conduct a general machine shop and automotive repair business, which for several years has been operated as a branch of the concern of same name with headquarters in Chicago.

The B. F. Sturtevant Co., Boston, Mass., is reported to have acquired the real estate, buildings and equipment of the former Wisconsin Engine Co., at Corliss, Racine county, Wis., for the purpose of establishing a western branch plant in behalf of its heating and ventilating equipment department. The Wisconsin Engine Co., originally the Brown Corliss Engine Co., was adjudicated bankrupt in 1913 and the works have been idle since that time with the exception of temporary use of parts of the plant by several manufacturing concerns and more recently the warehousing of Government war salvage stores.

The Western Pump Co., Davenport, Ia., manufacturer of shallow well pumping units has purchased the entire plant and business of the Chippewa Pump Co., Chippewa Falls, Wis., and is establishing the works as a new department to build deep-well pumps in which the former owners specialized.

The major interest in the Lipman Refrigerator Car & Manufacturing Co. of Beloit, Wis., has been acquired by a number of manufacturers of Rockford, Ill., who with Carl E. L. Lipman, founder and president of the company, will continue its operation in Beloit as a manufacturer of automatic refrigerating units. New officers are: president, T. E. Swords; vice-president, C. E. L. Lipman; secretary, James E. Morash; treasurer, George O. Forbes; directors, W. A. Forbes, F. G. Hoagland and D. F. Swords. All but Mr. Lipman are residents of Rockford. The Forbes interests own the Rockford Malleable Iron Works; the Swords interests, the Swords Bros. Co., and Mr. Hoagland is president of the National Lock Co.

The American-Oregon Lumber Co. will build a $1,000,000 saw and planing mill at Vernonia, Ore., and has placed the contract for the structural steel, amounting to 1,400 tons, with the Wisconsin Bridge & Iron Co., Milwaukee.

The Racine Pure Milk Co., Racine, Wis., is inquiring for a 40-ton ice machine. Cahill & Douglas, Milwaukee, are the consulting engineers.

The Seamless Products Co., Milwaukee, Wis., specializing in the manufacture of acetylene gas tanks, has made arrangements for the immediate reconstruction of its plant, almost totally destroyed by fire March 1. The owner of the building, the McClymont Marble Co., will erect a new brick and steel shop, 60 x 250 ft., 1½ stories high, on the same site, at Twenty-seventh and Canal Streets. Practically all of the machinery was damaged beyond repair and will be replaced. E. J. Lansing, president and general manager, is in charge.

Negotiations are pending for the sale of the Cortland Steel & Tube Co., near Youngstown, Ohio, to a large automobile manufacturing company, according to B. F. Spencer, the new owner of the Cortland Co.

Contracts have been awarded for the construction of the two million dollar expansion of the Ford Plate Glass Co. at Rossford, Ohio.

By a merger recently effected, the Cox Brass Manufacturing Co. has been united with the Cox Brothers Manufacturing Co., Inc., under the name of the Cox Brothers Manufacturing Co. The company makes bumpers and other automotive parts. It is located at Albany, N. Y., with a branch at Cleveland, Ohio.

The central sales office of the Naval Department, United States Government, will have a sale of surplus chain, clump, composition and snatch blocks. Sealed bids will be opened at 11 a.m. on April 17 at the Navy Yard, Washington, D. C.

The Milwaukee Machinery Co., Milwaukee, Wis., has been given the exclusive sales rights in that territory by the Rockford Machine Tool Co., Rockford, Ill., for its products.

The Baltimore & Ohio railroad has ordered 75 locomotives of the Sante Fe type to cost approximately $6,000,000. The company also recently had fifty of its old engines rebuilt.

The Atlas Die-Casting Corp., Worcester, Mass., has been incorporated under the laws of Massachusetts with a capital stock of $100,000. The concern will operate a plant in Worcester. Edwin G. Norman is president and Alexander B. Campbell, 314 Main St., Worcester, is treasurer.

The Triplex Machine Tool Corp., New York, was awarded the gold medal highest award at the International Exposition of Inventions held recently at the Grand Central Palace, New York, for the exhibit of its combination bench lathe, milling and drilling machine.

The Carr-Trombley Manufacturing Co., St. Louis, Mo., millwork, announces the addition to its factory at Second and Branch Sts. to cost approximately $250,000.

A deal involving ten acres of land at Tarrant City, Fla. has been consumated and it is announced by Ernest Creher that a steel fabricating plant will be erected within the near future. The property adjoins the plant of the National Cast Iron Pipe Co. Mr. Creher is interested in shipbuilding at Tampa, Fla.

The newly enlarged plant of the Saco-Lowell Shops, of Boston, that has been under construction for some time at Charlotte, N. C., is now practically completed and announcement has been made that it will shortly be ready for operation. This company is a large manufacturer of textile machinery and parts, and the Charlotte plant will be used principally for repair work, handling the company's trade in the southern territory.

The Production Engineering Corp., Canastota, N. Y., announces its incorporation to take over the business of the Marvin & Casler Co., of Canastota. The new corporation will continue to manufacture and sell the Casler boring heads, drill chucks, reamer holders, planer jacks and other tools. It will also engage in the design and construction of special machinery and tools.

The Illinois Electric Power Co. has acquired property rights on the Illinois River near Peoria where it is expected the company will build a super-power generating station with an initial installed capacity of 53,000 horsepower and an ultimate capacity of 133,000 horsepower. The cost of the station and lines will be about $4,250,000 which will be provided by a new financing issue.

Gross sales to the amount of $210,941,000 in 1922 were reported by the Western Electric Co. in its annual statement recently issued. This shows a gain of $21,176,000 over the gross sales of 1921 and is the largest volume of business in the history of the company. Charles C. Dubois, president of the company, predicts a further increaes during 1923.

The Bayonne Steel Casting Co., Bayonne, N. J., to be known from now on as the Eastern Steel Castings Co., is moving its equipment from Bayonne to a plant at Avenue L and Edwards St., Newark, N. J. The buildings which comprise its new home were purchased from the American Brake Shoe and Foundry Co. One million dollars is given as the estimate of the value of the property. Dissolution of the Bayonne Steel Casting Co. will result after the Eastern Steel Castings Co. has acquired the organization and equipment of the old company. Although the complete plant is not expected to be in operation before June 15, it is believed that one unit will be running April 1.

The Stark Glass Co., Massillon, Ohio, has been incorporated for $300,000 to manufacture the Winder-Daubenspeck wide-mouth-jar machine in this country. At a recent meeting of stockholders the following officers and directors were elected: I. M. Taggart, president; A. J. Sonnhalter; W. H. Crawford, secretary and treasurer; M. R. Bissell; E. A Griffiths, vice-president; E. H. Nelson; C. P. McLain; W. E. N. Hemperly; and P. L. Hunt.

At a recent meeting of the directors of the newly incorporated Cambridge Steel Products Co., Cambridge, Ohio, the following officers were elected: Arthur J. Bennett, president; William Rigby, vice-president; Thomas Davis, secretary and treasurer. Directors named include: Arthur J. Bennett, William Rigby, Homer A. Forsythe, Thomas Davis, M. L. Hartley, B. C. Thompson, C. O. Watson and C. S. Turnbaugh.

Purchase of the plant of the Federal Radiator Co. at Zanesville, Ohio, by the Pierce, Butler & Pierce Manufacturing Co. of New York, is announced. The new owners have assumed charge of the plant. Additional equipment involving $15,000 will be installed. The directors are: J. T. Duryea, New York; C. F. Bennett, New York; Arthur C. Allyn, Chicago; Stewart Hancock, Syracuse; Irving S. Beeler, Syracuse; Acosta Nichols, New York; and Levi S. Chapman, Syracuse. Officers are J. T. Duryea, president, C. F. Bennett, secretary and treasurer.

Export Opportunities

The Bureau of Foreign and Domestic Commerce, Department of Commerce, Washington, D. C., has inquiries for the agencies of machinery and machine tools. Any information desired regarding these opportunities can be secured from the above address by referring to the number following each item.

Furnace equipment for burning powdered coal. Spain. Purchase and agency. Quotations, c.i.f. Gijon. Terms. Payment against document. Correspondence Spanish. Reference No. 5748.

Metal-working Lathes. Italy. Manufacturers' agency. Quotations, c.i.f. Italian port. Terms, cash against documents. Reference No. 5751.

Machinery for wood-working, candy making, knitting, and can making. Italy. Manufacturers' agency. Quotations, c.i.f. Italian port. Terms, Cash against documents. Correspondence, Italian. Reference No. 5753.

Machinery for curving steel plates of a thickness of 15 mm. and a length of three m. and 50 cm. for the manufacture of enameled tanks, to be operated by an electric motor. France. Purchase. Quotations, c.i.f. French port. Correspondence, French. Reference No. 5754.

Gasoline propelled portable cranes for handling cargo on docks, capacity one to five tons, equipped with motors and mounted on platforms to be used at docks where there are no railroads. Spain. Purchase and agency. Terms, Payments against documents. Correspondece, Spanish. Reference No. 5756.

Electric welding machinery, Norway, Manufacturers' agency. Reference No. 5791.

Forthcoming Meetings

National Metal Trades Association. Twenty-fifth annual convention to be held at Hotel Astor, New York City, April 18 and 19. L. W. Fischer, secretary.

Society of Industrial Engineers. Spring convention at Hotel Gibson, Cincinnati, Ohio, April 18 to 20. Secretary, George C. Dent, 327 South La Salle St., Chicago, Ill.

American Gear Manufacturers' Association. Seventh annual meeting April 19, 20 and 21, Hotel Cleveland, Cleveland, Ohio.

National Foreign Trade Council. Annual meeting at the Grunewald Hotel, New Orleans, La., May 2, 3 and 4, 1923. O. K. Davis, Secretary, 1 Hanover Square, New York City.

American Foundrymen's Association. Annual convention, and exhibition at Public Hall, Cleveland, Ohio, April 30 to May 3, 1923. C. E. Hoyt, 140 South Dearborn St., Chicago, is secretary.

American Electro Chemical Society, Semi-annual meeting, Hotel Commodore, New York City, May 3 to 5, 1923. Colin G. Fink, 327 South La Salle St., Chicago, Ill., is secretary.

National Supply and Machinery Dealers' Association; Southern Supply and Machinery Dealers' Association; and the American Supply and Machinery Manufacturers' Association, triple convention, in Cincinnati, Ohio, May 17, 18, 19, 1923. F. D. Mitchell, 1819 Broadway, New York City, is secretary.

American Society of Mechanical Engineers. Spring meeting at Montreal, Can. May 28 to 31. Calvin W. Rice, 29 W. 39th St., New York City.

American Society for Testing Materials. Annual meeting at Atlantic City, June, 1923. C. L. Warwick, 1315 Spruce St., Philadelphia, is secretary.

Society of Automotive Engineers. Summer Meeting. Spring Lake, N. J., June 19 to 23.

American Society for Steel Treating. Eastern sectional meeting, Bethlehem, Pa., June 14 and 15. Hotel reservations through George C. Lilly, Superintendent of Heat Treatment, Bethlehem Steel Co., Bethlehem, Pa.

The Weekly Price Guide

RISE AND FALL OF THE MARKET

Advances—Furnace coke up 25c. per net ton in week; rise due to increased foreign demand. Pig-iron output heaviest in several months; No. 2 foundry up 50c., bessemer, $1.50 and basic, $2 per gross ton at Pittsburgh. Actual quotations on steel plates, $2.40@$2.65 per 100 lb., f.o.b. Pittsburgh; $2.30 mentioned nominally. Plate mills heavily booked; declining orders. No let up in oil-tank plate inquiries; railroad car buying heavier. Automotive industry breaking production records. Steel shapes and bars, $2.30@$2.60 on current business; $2.25 no longer quoted by mills. Blue annealed sheets up 35c. and galvanized, 25c. per 100 lb. at mill.

Electrolytic copper quoted at 18¼c. as against 17⅞c. per lb., one week ago. Zinc advanced 5c. per 100 lb. in New York and East St. Louis. Fabricated brass and copper products up ¼c.@½c. per lb. in New York; copper sheets advanced ½c. and aluminum ingots 1c. per lb. in Cleveland warehouses.

Raw linseed oil, in 5 bbl. lots, $1.08 per gal. f.o.b. New York, as against $1.04; Cleveland reports $1.10, compared with $1.08, one week ago.

Declines—Lead 8¾c. as against 9c. per lb. in New York; seasonal slackening in demand approaching. Antimony down ½c. per lb.; market experiencing a period of easing prices.

IRON AND STEEL

PIG IRON — Per gross ton — Quotations compiled by The Matthew Addy Co.:

CINCINNATI	
No. 2 Southern	$31.55
Northern Basic	31.27
Southern Ohio No. 2	31.55
NEW YORK—Tidewater Delivery	
Southern No. 2 (silicon 2.25@2.75)	33.44
BIRMINGHAM	
No. 2 Foundry	27.00
PHILADELPHIA	
Eastern Pa., No. 2x (silicon 2.25@2.75)	34.17
Virginia No. 2	34.17
Basic	30.50
Grey Forge	31.00
CHICAGO	
No. 2 Foundry local	31.00
No. 2 Foundry, Southern (silicon 2.25@2.75)	32.01
PITTSBURGH, including freight charge from Valley	
No. 2 Foundry	30.50
Basic	31.00
Bessemer	31.00

IRON MACHINERY CASTINGS—Cost in cents per lb. of 100 flywheels, 6-in. face x 24-in. dia., hub not cored, good quality gray iron, weight 275 lb.:

Detroit	6.0
Cleveland	5½@6¼
Cincinnati	4@6
New York	5¼@5¾
Chicago	4@5

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the base quotations from mill:

Blue Annealed	Pittsburgh, Large Mill Lots	New York	Cleveland	Chicago
No. 10	2.65@3.25	4.34	3.75	4.15
No. 12	2.75@3.35	4.39	3.80	4.20
No. 14	2.85@3.45	4.44	3.85	4.25
No. 16	3.05@3.65	4.54	3.95	4.35
Black				
Nos. 17 and 21.	3.35@3.60	4.70	4.40	4.85
Nos. 22 and 24.	3.40@3.65	4.75	4.45	4.85
Nos. 25 and 26.	3.45@3.70	4.80	4.50	4.90
No. 28	3.50@3.75	4.90	4.60	5.00
Galvanized				
Nos. 10 and 11.	3.60@4.00	4.90	4.65	4.85
Nos. 12 and 14.	3.70@4.10	5.00	4.75	4.95
Nos. 17 and 21.	4.00@4.40	5.30	5.05	....
Nos. 22 and 24.	4.15@4.55	5.45	5.20	5.40
No. 26	4.30@4.70	5.60	5.45	5.55
No. 28	4.60@5.00	5.90	5.75	5 85

WROUGHT PIPE—The following discounts are to jobbers for carload lots on the latest Pittsburgh basing card:

Steel Inches	Black	Galv.	BUTT WELD Inches	Iron Black	Galv.
⅛ to 3	64	52½	¼ to 1½	30	13
			LAP WELD		
2	57	45½	2	23	7
2½ to 6	61	49½	2½ to 4	26	11
7 to 8	58	45½	4½ to 6	28	13
9 to 12	57	44½	7 to 12	26	11
			BUTT WELD, EXTRA STRONG, PLAIN ENDS		
1 to 1½	62	51½	¼ to 1½	30	14
2 to 3	63	52½			
			LAP WELD, EXTRA STRONG, PLAIN ENDS		
2	55	44½	2	23	9
2½ to 4	59	48½	2½ to 4	29	15
4½ to 6	58	47½	4½ to 6	28	14
7 to 8	54	41½	7 to 8	21	7
9 to 12	48	35½	9 to 12	16	2

WROUGHT PIPE—Warehouse discounts as follows:

	New York Black	New York Galv.	Cleveland Black	Cleveland Galv.	Chicago Black	Chicago Galv.
1 to 3 in. steel butt welded	54%	41%	55½%	43½%	62½%	48½%
2½ to 6 in. steel lap welded	51%	38%	53½%	40½%	59½%	45½%

Malleable fittings: Classes B and C, banded, from New York stock sell at list plus 5%. Cast iron, standard sizes, 25% off.

MISCELLANEOUS—Warehouse prices in cents per pound in 100-lb. lots:

	New York	Cleveland	Chicago
Open hearth spring steel (base)	4.50	6.00	4.50
Spring steel (light) (base)	7.00	6.00	6.00
Coppered Bessemer rods(base)	6.03	8.00	6.10
Hoop steel	4.69	4.51	4.45
Cold rolled strip steel	7.00	8.25	7.25
Floor plates	5.65	5.46	5.65
Cold finished shafting or screw	4.20	3.90	4.10
Cold finished flats, squares	4.70	4.40	4.60
Structural shapes (base)	3.44	3.31	3.20
Soft steel bars (base)	3.34	3.21	3.10
Soft steel bar shapes (base)	3.34	3.21	3.10
Soft steel bands (base)	4.14	3.61	3.85
Tank plates (base)	3.44	3.31	3.20
Bar iron (3.00 at mill)	3.34	2.91	2.92½
Carbon tool steel	11.00	....	....
Drill rod (from list)	55%	40@55%	50%
Electric welding wire:			
5/32	8.50		14.00
⅛	7.35		12.25
5/32 to ¼	7.10		11.00

METALS

Current Prices in Cents Per Pound

Copper, electrolytic (up to carlots), New York			18.12½
Tin, 5-ton lots, New York			50.75
Lead (up to carlots), St. Louis	8.30;	New York.	8.75
Zinc (up to carlots), St. Louis	8.00@8.05;	New York.	8.40

	New York	Cleveland	Chicago
Aluminum, 98 to 99% ingots, 1-15 ton lots	26.20	27.00	28.00
Antimony (Chinese), ton spot	9.75	11.50	10.50
Copper sheets, base	25.00	25@25.50	23.00
Copper wire (l.c.l.)	19.62½	21.50	16.25
Copper bars (l.c.l.)	23.75	24.75	19.50
Copper tubing (l.c.l.)	27.50	29.75	23.00
Brass sheets (l.c.l.)	21.50	24.75	18.75
Brass tubing (l.c.l.)	26.00	29.75	20.50

Shop Materials and Supplies

METALS—Continued

	New York	Cleveland	Chicago
Brass rods (carlots)	19.62½	21.75	15.75
Brass wire (carlots)	22.00	22.00	.....
Zinc sheets (casks)	11.50	11.00	.....
Solder (½ and ¼), (caselots)	37.00	31.75@34.75	20.00
Babbitt metal (83% tin)	65.00	59.00	36.00
Babbitt metal (35% tin)	40.00	18.50	.....
Nickel (ingot and shot), Bayonne, N. J.	29.00	.....	.....
Nickel (electrolytic), Bayonne, N. J.	32.00	.....	....

SPECIAL NICKEL AND ALLOYS—Price in cents per lb.

Malleable nickel sheet (base)	55
Hot rolled rods, Grade "A" (base)	50
Cold drawn rods, Grade "A" (base)	60
Copper nickel ingots	37
Hot rolled copper nickel rods (base)	45
Manganese nickel hot rolled rods "E"—low manganese (base)	54
Manganese nickel hot rolled rods "D"—high manganese (base)	57

Base price of monel metal in cents per lb., f.o.b. Huntington, W. Va.:

Shot	32.00	Hot rolled machined rods (base)	48.00
Blocks	32.00	Hot rolled rods (base)	40.00
Ingots	38.00	Cold drawn rods (base)	46.00
Hot rolled sheets (base)			45.00

OLD METALS—Dealers' purchasing prices in cents per pound:

	New York	Cleveland	Chicago
Copper, heavy, and crucible	14.75@15.25	14.00	15.50
Copper, heavy, and wire	14.50@15.00	13.50	14.75
Copper, light, and bottoms	12.50@13.00	12.00	13.75
Lead, heavy	6.25@ 6.75	6.50	7.25
Lead, tea	5.75@ 6.00	5.00	6.25
Brass, heavy, yellow	8.75@ 9.00	....	9.50
Brass, heavy, red	12.25@12.75	12.00	12.50
Brass, light	7.25@ 7.75	7 50	8.50
No. 1 yellow brass turnings	8.75@ 9.00	8.50	9.25
Zinc	5 00@ 5.50	4.50	5.25

TIN PLATES—American Charcoal Plates—Bright—Cents per lb.

		New York	Cleveland	Chicago
"AAA" Grade:				
IC,	20x28, 112 sheets	22.00	18.25	18.50
IX,	20x28, 112 sheets	24.50	21.00	20.90
"A" Grade:				
IC,	20x28, 112 sheets	19.50	16.00	17.00
IX,	20x28, 112 sheets	22.00	18.75	19.60
Coke Plates, Bright				
Prime, 20x28 in.:				
100-lb.,	112 sheets	13.00	12.20	14.50
IC,	112 sheets	13.30	12.60	14.80
Terne Plate				
Small lots, 8-lb. Coating:				
100-lb.,	14x20	7.00	6.30	7.25
IC,	14x20	7.25	6.55	7.40

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb.	$0.10@0.13	$0.15	$0.11½
Cotton waste, colored, per lb.	.07@.12	.12	.08
Wiping cloths, 13½x13½, per lb.	.16	36.00 per M	.10
Wiping cloths, 13½x20½, per lb.	.20	52.00 per M	.13
Sal soda, 100 lb. lots	2.60	3.50	2.65
Roll sulphur, per 100 lb	2.65	3.25	3.50
Linseed oil, per gal., 5 bbl. lots	1.08	1.10	1.15
White lead, dry or in oil	100 lb. kegs.	New York, 14.25	
Red lead, dry	100 lb. kegs.	New York, 14.25	
Red lead, in oil	100 lb. kegs.	New York, 15.75	
Fire clay, per 100 lb. bag		.65	.60
Coke, prompt furnace, Connellsville	per net ton		$7.50
Coke, prompt foundry, Connellsville	per net ton		8.00

SHOP SUPPLIES

Current Discounts from Standard Lists

	New York	Cleveland	Chicago
Machine Bolts:			
All sizes up to 1x30 in.	40%	50-10%	50%
1½ and 1¼x3 in. up to 12 in.	20%	50%	50%
With cold punched sq. nuts	25%	$3.50 net	....
With hot pressed hex. nuts up to 1x30 in. (plus std. extra of 10%)	30%	3.50 net	$4.00 off
Button head bolts, with hex. nuts	15%	3.90 net	.....
Hex. head and hex. nut bolts	20%	.....	65-5%
Lag screws, coach screws	40%	.....	60-5%
Square and hex. head cap screws	70%	70%	70-10%
Carriage bolts, up to 1 in. x 30 in.	30%	45%	45%
Bolt ends, with hot pressed nuts	40%	.....	55%
Tap bolts, hex. head, list plus	20%	.....	.....
Semi-finished nuts ⅝ and larger	60%	65-10%	80%
Case-hardened nuts	50%	.....	.....
Washers, cast iron, ½ in., per 100 lb. (net)	$6.00	$4.00	$3.50
Washers, cast iron, ⅝ in., per 100 lb. (net)	4.50	4.00	3.50
Washers, round plate, per 100 lb. Off list	3.00	4.50	3.50 net
Nuts, hot pressed, sq., per 100 lb. Off list	1.00	2.75	4.00
Nuts, hot pressed, hex., per 100 lb. Off list	1.00	2.75	4.00
Nuts, cold punched, sq., per 100 lb. Off list	1.00	2.75	4.00
Nuts, cold punched, hex., per 100 lb. Off list	1.00	2.75	4.00
Rivets:			
Rivets, 7/16 in. dia. and smaller	45%	50-10%	60%
Rivets, tinned	50%	50-10%	4½c. net
Button heads ¾-in., ⅞-in., 1x2 in. to 5 in., per 100 lb (net)	$5.00	$3.90	$3.75
Cone heads, ditto (net)	5.10	4.00	3.85
1⅛ to 1¼-in. long, all diameters, *EXTRA* per 100 lb	0.25	.....	0.15
⅝ in. diameter *EXTRA*	0.15	.....	0.15
½ in. diameter *EXTRA*	0.50	.....	0.50
1 in. long, and shorter *EXTRA*	0.50	.....	0.50
Longer than 5 in. *EXTRA*	0.25	.....	0.25
Less than 200 lb. *EXTRA*	0.50	.....	0.50
Countersunk heads *EXTRA*	0.35	.....	$3.70 base
Copper rivets	50%	35%	50%
Copper burs	30%	35%	20%

Lard cutting oil (50 gal. bbl.) per gal.	$0.55	$0.50	$0.67½
Machine lubricant, medium-bodied (50 gal. bbl.), per gal.	0.297	0.35	0.40
Belting—Present discounts from list in fair quantities (½ doz. rolls).			
Leather—List price, New York, per ply, 12-in. wide, per lin. ft., $2.88:			
Medium grade	30-10%	40½%	50%
Heavy grade	20-5-2½%	30-5%	40-5%
Rubber and duck:			
First grade	60%	50-10%	40-10%
Second grade	65%	60-5%	60-5%
Abrasive materials—In sheets 9x11 in.,			
No. 1 grade, per ream of 480 sheets:			
Flint paper	$5.84	$5.84	$6.48
Emery paper	8.80	11.00	8.80
Emery cloth	27.84	31.12	29.48
Flint cloth, regular weight, width 3½ in., No. 1 grade, per 50 yd. roll.	4.50	4.28	4.95
Emery discs, 6 in. dia., No. 1 grade, per 100:			
Paper	1.32	1.24	1.40
Cloth	3.02	2.67	3.20

New and Enlarged Shops

Machine Tools Wanted

Calif., Burbank — Moreland Truck Co. (garage)—18 in. x 18 ft. heavy duty lathe for straightening shafts.

Calif., San Bernardino—W. D. Anderson (machine shop)—12 x 16 in. to 20 x 24 in. iron lathe.

Ill., Chicago—International Harvester Co., 606 South Michigan Ave.—one bending machine.

Ill., Oak Park—Wielpi & Lawrence—drill press for garage and air compressor.

Kan., Parsons—E. E. Newberry (machinist)—trip hammer, 50 lb. head.

Kan., Wichita—G. Harrison, 1236 East Douglas Ave. (garage and machine shop)—drill press and electric drill.

Mass., Boston—M. Gerber, 2150 Washington St. (machine shop)—lathe, about 18 in. x 6 ft. (used).

Mass., Boston — B. F. Sturtevant Co., Hyde Park (blower systems)—gate shear, ¾ in. steel plate capacity, 120 in. between housings (used).

Mass., Dorchester (Boston P. O.) — Baker, Payne, Voye Co., 1177 Adams St. (sheet metal workers)—8 ft. power square shear (used).

Mass., Foxboro — Foxboro Co., Inc. (manufacturer of tools), address Purchasing Agent—machine tools for addition to plant.

Mich., Detroit—Detroit Twist Drill Co., 2108-46 West Fort St.—screw machine, 1 or 1¼ in. capacity, wire feed attachment, counter shaft; oil pump and drop hammers, 200 lb. standard, with belt lift.

Mich., Detroit—A. N. Haskell, 1045 Hubbard Ave.—plain drop hammer, 200 or 250 lb., belt lift type.

Mich., Detroit—Monarch Stamping Co., 1402 4th St.—equipment for the manufacture of light sheet metal automobile parts for automobiles.

Minn., Minneapolis—Stein Electric Shears Co., 1134 Dupont Ave. N., (manufacturer of barbers' shears)—one power stamping press.

Mo., Joplin — Lewis Machine Co., 2nd and Joplin Sts., H. L. Lewis, Purch. Agt.—one 36 in. lathe.

Mo., Kansas City—B. McDonald Co., 20th and Washington Sts.—squaring shears for sheet metal work.

N. H., Hillsboro—F. J. Boyd—small tools for garage, including drills, reamers, punches, etc.; air compressor and tank, about 150 lb. pressure (used).

N. Y., Ballston Spa—E. Balmuth Co., Washington and Spring Sts. (machine shop and garage)—post drills, small engine lathe and machinery for battery charging and repair.

N. Y., Buffalo—A. H. Carter, Agt., 919 Kensington Ave.—additional garage and repair shop equipment.

N. Y., Henderson — Stevens Bros. Co., Main St., (garage, marine and motor repair), M. Stevens, Purch. Agt.—14 in. back geared engine lathe, vertical post drill and iron forge castings.

N. Y., Jamestown—Malrose Iron & Fuel Corp., Fluvanna Ave.—gasoline service station machinery, tools and equipment, including air pumps, etc.

N. Y., Lackawanna (Buffalo P. O.)—Bd. Educ., W. J. Breen, Supt. of Schools—machine shop and woodworking equipment for proposed trade school.

N. Y., Malone—T. Hinds Co., 107 Catherine St., (machine shop and foundry), J. B. Hinds, Purch. Agt.—brass furnace, upright post drill and bench milling machine.

N. Y., Ogdensburg—Hanan & Henry Motor Car Co. (garage, machine shop and marine repairs)—portable electric drill, Japan oven and internal grinder, Heald or similar.

N. Y., Old Forge—Old Forge Garage Co., Inc., Eagle Bay Rd., W. S. Glenn, Purch. Agt.—one milling machine for repair shop (new or used).

N. Y., Rochester—C. R. Dray, Agt., 528 Clinton Ave., S.—sheet metal and iron working machinery and equipment.

N. Y., Watertown—R. E. Parker, 144 Mechanic St. (machine shop)—one internal grinder.

O., Columbus—Chase Fdry. & Mfg. Co., Parsons Ave. along tracks of Hocking Valley Ry., S. M. Chase, Secy. and Genl. Mgr.—two turret lathes, two engine lathes and special pattern working machinery.

O., Columbus—Duplex Piston Mfg. Co., 272 North 3rd St., R. D. Hanish, Genl. Mgr.—one 12 in. turret lathe, two 12 in. engine lathes, automatic machine to cut ring groove and face off, also other equipment.

O., Columbus—Electric Power Equipment Co., 212 North 3rd St., (electrical repairs), E. L. Keller, Vice Pres. and Genl. Mgr.—small lathe and grinder.

O., Columbus—Jordan Columbus Co., 264 North 4th St., (garage and service station), B. M. Ellis, Pres. and Mgr.—one lathe and other equipment for larger shop.

Ore., Portland—J. C. Plopper & Co., 6748 62nd St., S. E. (tinners and plumbers)—punch and shear for angles up to 3 x 3 in. between drive.

Pa., Pittsburgh—Acme Stamping & Mfg. Co., 207 Corliss St.—double gear press, Bliss or equal.

Pa., Pittsburgh—Mansion Mfg. Co., Oliver Bldg., (manufacturer of sleeves and nozzles)—two auger machines and one electric crusher conveyor.

Pa., Sellersville—United States Gauge Co., A. R. Hendricks, Purch. Agt.—medium light punch press, Hendey & American tool room lathes and a No. 2 Brown & Sharpe Universal grinder.

Pa., Titusville—I. R. Phillips—garage, machine shop and service station equipment.

Pa., Titusville—A. G. Vrooman—machinery, tools and equipment for garage and service station on Central Ave.

Pa., Warren — Warren Machine Gear Products Co. (manufacturer of 3 speed transmission systems for Ford cars)—machinery and equipment for plant.

Tex., Houston—R. C. Duff, 802 Carter Bldg.—equipment for proposed railroad shops.

Tex., Mineral Wells—Machine Shop, Box 88—14 x 26 in. screw cutting engine lathe.

Wis., Madison—Madison Tool & Stamping Wks., 1970 Helena St.—small tools and equipment for automobile repair and regrinding department.

Wis., Madison—C. Tantillo, Regent St. and West Washington Ave.—automobile repair machinery, gasoline pumps and free air equipment for proposed $40,000 garage.

Wis., Milwaukee — Lighthouse Superintendent, Federal Bldg., C. H. Hubbard, Purch. Agt.—one air drill, one geared air drill and one air power wire brush.

Ont., Cedar Springs—H. Downey and H. Dewar—complete equipment for garage and repair shop.

Machinery Wanted

Ala., Albany—Decatur Cornice & Roofing Co.—slow speed cold saw.

Ala., Birmingham—Hammille Printing & Letter Co., 1714 3rd Ave., N.—Ludlow automatic type casting machine, one standard and one auxiliary linotype machine.

Ala., Florence—District Engineer, United States Engr. Office—receiving bids until Apr. 3 for furnishing head-gate track, screen track, sea castings, vent-outlet castings with bell-mouth castings, etc., for the power house section of Wilson Dam.

Calif., Los Angeles—Cabinet Shop, 1427 60th Pl., Maywood—power circular saw.

Calif., Los Angeles — Walsh Automatic Coupling Co., c/o Miller & Farrell, Archt., Western Mutual Life Bldg.—1½ ton traveling crane for proposed foundry at San Pedro.

Calif., San Francisco — The Guadalupe Lime & Cement Co., 16 California St.—equipment for proposed $250,000 cement plant at San Jose.

Conn., Bridgeport—P. Epifano, 25 Chestnut St. (builder)—portable saw cutting outfit (used).

Conn., Hartford — Philbrick-Booth Fdry. Co., 381 Homestead Ave.—5 ton traveling crane, 30 ft. span, hand operated (used).

Conn., Rockville—Rockville School Dept. vocational equipment for $400,000 high school.

Ill., Chicago—W. Reid Co., 537 South La Salle St.—job printing equipment.

Ill., Chicago—Washington Gas & Electric Co., 2031 Peoples' Gas Bldg.—coal and ash handling equipment for power house at Washington Court House, O.

Ill., Chicago — Wolcott Shop, 8006 Emerald Ave., J. Wolcott, Purch. Agt.—woodworking machinery.

Ill., Edwardsville—Madison County Mining Co.—$75,000 worth of equipment, including shaft, ventilation and hoisting facilities, etc.

Ill., Peoria—Aitken-Hagerty Supply Co.—iron and woodworking machinery, also laundry machinery and electric motors.

Ind., Wabash—J. F. Ferry (job printer)—power paper cutter.

Ia., Cedar Rapids—Disbrow Sash & Door Co., 627 South 1st St.—machinery and equipment for $200,000 addition to plant.

Mass., Greenwood—Geizer Press, address Manager—10 x 19 in. printing press, Chandler & Price preferred (used).

Mass., Methuen (Lawrence P. O.) — Chairman of School Bd.—woodworking machinery, including saws, tables, planers, matchers, sanders, lathes, etc., for new high school.

Mich., St. Joseph—Cooper-Wells Hosiery Mfg. Co.—machinery for proposed hosiery mill at Albany, Ala.

Mo., Kansas City—New Process Co., 836 Lee Bldg.—stills, condenser, box, pipe, oil pump, oil filtering and reclaiming equipment.

N. Y., Auburn—Enterprise Fdry. Co., 46 Washington St.—table or barrel sand blast equipment (used).

N. Y., Binghamton—C. H. Moss, 87 Carroll St.—gasoline and service station equipment.

N. Y., Binghamton—Parlor City Paper Box Co., 196-200 State St.—machinery and equipment for the manufacture of paper boxes.

N. Y., Binghamton—Sherwood & Risley, 69 East Catherine St. (manufacturer of ice cream cones)—complete machinery and equipment for 3 story addition to plant.

N. Y., Bombay—Shields Consolidated (manufacturer of shoes and moccasins)—power operated shoe stitchers and leather splitter.

N. Y., Brownville—L. M. Kilborne (woodworking)—6 in. bench jointer and sanding machine.

N. Y., Buffalo—H. T. Bently, 67 Elmwood Ave.—one small Hobart ¾ hp. electric beater and equipment for bakery.

N. Y., Buffalo—B. A. Fryer, 731 Jefferson Ave.—equipment for the manufacture of knit goods.

N. Y., Buffalo—F. W. Knukenberg, 702 Michigan Ave.—three drum steam hoists and stiff leg derrick.

N. Y., Buffalo—E. C. Randall, South Park Ave. and Colgate St.—service station equipment and two 15,000 gal. gasoline tanks and pumps.

N. Y., Celoron—Bd. Educ.—vocational equipment for $95,000 high school.

N. Y., Dolgeville—Breckwoldt Sounding Board Co. (piano parts)—one bandsaw complete with table and frame, also one double surface planer, Barnes or equal.

N. Y., Fulton—Iroquois Steel Co.—complete equipment for rolling mill.

N. Y., Geneva—Geneva Ice Cream Co., G. A. Wegner, 12 Amherst St., Rochester, Purch. Agt. — complete machinery and equipment for ice plant, capacity 30 ton per day.

N. Y., Gouverneur—E. Pettis Co., West Main St. (lumber, sash and doors)—slab gang saw with table and edger.

N. Y., Henderson—E. S. Howard, Main St. (vulcanizing, tire and rim repair) — wire brush machine and brushes for cleaning and scoring rubber; compressor and tank; vulcanizing molds.

N. Y., Jamestown—Arrow Garter Co., 226 Wellman Bldg.—machinery and equipment for 700 sq.ft. of floor space, for the manufacture of garters.

N. Y., Jamestown—Cold Springs Garage, Fluvanna Rd., C. A. Nelson, Proprietor—complete battery charging outfit.

N. Y., Jamestown — Jamestown Wood Finishing Co., East End (manufacturer of fillers, paints, etc.)—machinery and equipment for addition to plant.

N. Y., Little Falls—Herkimer Mills Co., Mohawk St.—raw stock dyeing machine and a raw stock drying machine for wool or cotton, 1,000 lb. capacity (used).

N. Y., Macedon—W. F. Walz—lathe, saw and table.

N. Y., New York—Amer. Cigar Co., 111 5th Ave.—equipment for proposed cigar plant at Newport, R. I.

N. Y., New York—Sunshine-Jasper Co., 59 East 8th St. (gas irons), M. Sunshine, Purch. Agt.—various sizes of steel bushings, already made up, for use in jigs.

N. Y., Rochester—Phillips Ribbon & Carbon Co., 17 Elm St.—machinery and equipment for the manufacture of carbon ribbon products.

N. Y., Rochester—Ward Bros. Co., Murray and Texas Sts.—mechanical equipment for $21,000 addition to bakery.

N. Y., Sauquoit—Sauquoit Canning Co., H. Milbower, Mgr.—special filling machinery for tin containers.

N. Y., Theresa — Flaxwood Corp. (textiles), P. H. Slate, Otis Bldg., Watertown, Purch. Agt.—cold rolled shafting, ¾ to 2 7/16 in.; several transmission line clutches; hangers and couplings; prices on 16 to 30 in. steel split pulleys.

N. Y., Watertown—Taggart Bros. Paper Co., West Main St., J. Taggart, Purch. Agt.—roll grinding machine and power operated metal saw, capacity up to 6 x 6 in.

N. C., Charlotte — Lockwood, Greene & Co., Engrs., Piedmont Bldg.—receiving bids for machinery for proposed cotton mill of the Pacific Mills at Duncan, S. C.

N. C., Raleigh—H. S. Storr Co., 120 West Martin St.—woodworking machinery and equipment, to replace that which was destroyed by fire.

N. C., Statesville—C. H. Turner's Fdry.—complete foundry equipment.

O., Cincinnati — Cincinnati Galvanizing Co., McMicken Ave., A. Schott, Pres.—furnaces, cranes and hoists.

O., Dover—F. J. Lewis Mfg. Co.—machinery and equipment for plant for the manufacture of tar and tar products, to replace that which was destroyed by fire.

O., Galion—E. M. Freese & Co. (brick and clay working machinery)—one 3 ton crane, cupola and blowers.

O., Newark—Upson Coal Co., G. Upson, Pres. and Mgr.—special equipment, including shaker screens and loading boom, for mine at Dixie.

O., St. Bernard (Cincinnati P. O.)—The city, J. A. Broxterman, Dir. of Public Service—receiving bids until Apr. 3 for furnishing, delivery and erection of coal handling equipment.

O., Youngstown — Melvin Rail Splicing Co., Inc., C. H. Melvin, Pres.—machinery and equipment for proposed rail splicing plant at Warren.

Pa., Erie—Goekler Mfg. Co., 12th St.—additional machinery and equipment for the manufacture of refrigerator parts.

Pa., Honesdale—J. C. Welwood Silk Co.—machinery and equipment for silk mill at Lake Ariel (Ariel P. O.).

Pa., Johnstown—Henderson Bros., 221 Market St.—laundry and dry cleaning equipment.

Pa., Latrobe—Vulcan Mold & Iron Co., E. H. Williams, Purch. Agt.—one 5 ton special low head room crane.

Pa., Phila.—M. Bernheim & Sons Co., 3rd and Master Sts. (manufacturer of furniture)—sanders, boring machines, tenon machines, saws, etc.

Pa., Phila.—J. A. Beyer, 312 Fairmount Ave. (iron works)—one 50 in. or larger, roller for heavy sheets.

Pa., Phila.—Carrick & Husted, Lehigh Ave. and Mutter St., (nickel plating works), A. Carrick, Purch. Agt.—electroplating equipment, buffing machines, etc., for new plant.

Pa., Phila.—Pennsylvania Axminster Carpet Co., 10th and Diamond Sts., A. Folwell, Purch. Agt.—vats, centrifugal dryers, drying machines, etc.

Pa., Pittsburgh — Amer. Window Glass Co., Farmers' Bank Bldg., W. L. Monro, Pres. and Genl. Mgr.—10 mechanically operated heavy duty type gas producers.

Pa., Pittsburgh—Bessemer & Lake Erie R.R., Carnegie Bldg., (subsidiary of Carnegie Steel Co.), W. A. Parker, Purch. Agt.—one jib crane.

Pa., Pittsburgh—F. I. Ellis, Engr. Farmers' Bank Bldg.—six sheet mills and other equipment, including one 75 ton ladle crane, one 5 ton stripper crane, two 3 ton jet cranes and two 10 ton cranes with 10 ton auxiliary.

Pa., Pittsburgh—Jones & Laughlin Steel Corp., 3rd Ave. and Ross St., A. Ochsenhirt, Purch. Agt.—two 15 ton cranes for Soho and Woodlawn plants.

Pa., Pittsburgh—Pittsburgh Plate Glass Co., Frick Bldg.—10 ton, 3 cu.yd. bucket crane for Zanesville, O.

Pa., Pittsburgh—Union R.R. Co., Carnegie Bldg., (subsidiary of Carnegie Steel Co.), W. A. Parker, Purch. Agt.—one single I beam crane.

Pa., Russell—H. Crecast—blacksmith shop equipment, to replace that which was destroyed by fire.

Pa., Russell—W. Phillips—blacksmith shop equipment.

Pa., Tacony (Phila. P. O.)—Electric Fdry. & Engine Co.—one 5 ton electric hoist, 2 phase, 220 volt.

Pa., Warren—Jacobson Gas Engine Co.—machinery and equipment for factory to replace that which was destroyed by fire.

R. I., Providence — M. F. Williams Co. (manufacturer of jewelry), address Purchasing Agent—grinders, polishers, etc., also tools for very fine metal work.

S. C., Badham—Dorchester Lumber Co.—edging grinder for planing mill.

Tenn., Fayetteville—J. L. Dorsey—12 to 20 ton ice plant, including boiler large enough to furnish additional power for other machinery.

Tex., Dallas—F. Neugebauer, 4005 Euclid Ave., (cabinet maker)—power silent cutter with power attachment, belting and electric motor.

Tex., Dallas—Print Shop, 1701 Hickory St.—12 x 18 in. platen press.

Tex., Jayton—W. J. Wade (job printer)—linotype.

Wash., Aberdeen—Grays Harbor Veneer Co., A. A. Bator, Purch. Agt.—machinery for proposed veneer plant at Hoquiam.

Wash., Cheney—Print Shop—Miehle job press.

W. Va., Clarksburg—G. W. Riley—machinery and equipment for plant for the manufacture of automobile tops.

W. Va., Moundsville—Marshall Dairy Products Co.—15 ton ice ammonia compressor.

W. Va., Wheeling—The city, R. A. Conrad, Engr., City Hall—10 ton, 39 ft. 8 in., 3 motor crane for filtration plant.

Wis., Appleton—Northern Boiler & Structural Iron Wks., W. H. Timm, Mgr.—two electric traveling cranes (new) and floor equipment for fabricating shops.

Wis., Cassville — Klindt-Geiger Canning Co., c/o A. J. Klindt—power machinery and canning machinery to can peas.

Wis., Hortonville—Fox Valley Canning Co., J. Pritchard, Purch. Agt.—canning machinery, including sealers, fillers, cookers, etc.

Wis., Madison—C. B. Fritz, 138 North Frances St. — woodworking machinery, planer and power machinery for proposed $50,000 shop.

Wis., Madison—M. A. Wahl, 117 West Johnson St.—laundry equipment, including dryers, for proposed apartment building.

Wis., Milwaukee—Central Product Co., c/o J. A. Padway, 603 Caswell Block—refrigeration machinery, several ton capacity.

Wis., Milwaukee—Frank Pure Food Co., 288 East Water St.—special kraut-canning machinery, belting and shafting for proposed additions to factory at Franksville.

Wis., Milwaukee—C. A. Rodemann, 1925 Nash St. (woodworker) — combination jointer and saw.

Wis., Milwaukee—W. Schroeder, 86 Michigan St.—ice machine, capacity from 5 to 10 ton.

Wis., St. Francis—J. Handle (woodwork)—12 in circle saw, double arbor.

Wis., Shullsburg—Northern Mining Co.—mill equipment and power machinery for Paquette mine.

Wis., Union Grove—Bd. Educ., E. H. Swantz, Secy.—manual training and woodworking equipment for proposed grade and high school.

Wis., Wauwatosa—P. Kuehlhorn, Burleigh Rd., R. F. D. (meat products)—refrigeration machinery, medium size.

N. S., Oxford—Oxford Mfg. Co. (textiles)—upright drying machine, 80 in. wide, 200 yd. capacity (used).

Ont., Alexandria—Graham Creamery Co., Ltd., R. M. Graham, Purch. Agt.—complete equipment for creamery.

Ont., Dresden—A. Cameron, Main St.—complete machinery and equipment for grist mill, to replace that which was destroyed by fire.

Ont., Windsor—T. Bryan, 182 Elm Ave.—complete oxy-acetylene welding outfit.

Que., Coaticook—V. Gobeil — complete equipment for new bakery.

Que., Lachine—Saxonia Fruit Preserving Co., Ltd., A. Lefebre, Purch. Agt.—machinery and equipment for plant, required in May.

Que., Montreal—Harbor Comrs. of Montreal, M. P. Fennell, Jr., Genl. Mgr. and Secy.—complete conveying and elevating equipment for proposed grain elevator.

Que., Thetford Mines—J. Proulx—one cupola, 30 in. inside lining; blower; foundry and plating equipment for the manufacture of grey iron castings and electroplating.

Que., Three Rivers—International Paper Co., Ltd.—grinder unit for ground wood pulp and digester for sulphate pulp.

Metal Working Shops

Calif., Richmond—The Pacific Sanitary Mfg. Co., 67 New Montgomery St., San Francisco, awarded the contract for the construction of a factory for the manufacture of plumbing fixtures, here. Estimated cost $150,000.

Calif., San Francisco—The Christie Machine Wks., 191 Fremont St., awarded the contract for the construction of a 1 story machine shop on Howard St. near Beale St. Estimated cost $15,000.

Calif., San Francisco—E. and H. Lewis, 334 6th St., awarded the contract for the construction of a 1 story machine shop on Folsom St. near 9th St. Estimated cost $3,000. Noted Mar. 15.

Calif., San Pedro—The Walsh Automatic Coupling Co., c/o Miller & Farrell, Archts., Western Mutual Life Bldg., Los Angeles, is having plans prepared for the construction of a 1 story, 150 x 180 ft. foundry, here.

Calif., Taft — The Taft Union High School Dist., E. W. Nisbet, Jr., Clk., will receive bids until Apr. 3 for the construction of a group of school buildings, including auditorium, gymnasium and shop buildings. Estimated cost $150,000. W. H. Weeks, 369 Pine St., San Francisco, Archt. Noted Jan. 25.

Conn., Bridgeport—H. J. Platt, 388 Fairfield Ave., is receiving bids for the construction of a 1 story, 107 x 176 ft. garage, automobile sales and service station. Estimated cost $50,000. Private plans.

Ill., Chicago—The Broderick Teaming Co., 3221 Shields Ave., awarded the contract for the construction of a 1 story, 100 x 125 ft. garage at 3226 Shields Ave. Estimated cost $40,000.

Ill., Chicago—Crocker, Kracow & Geiber, c/o D. S. Klafter, Archt., 64 West Randolph St., are having plans prepared for the construction of a 2 story garage and office building at 4117-25 Bway. Estimated cost $275,000.

Ill., Chicago—The Harrington & King Perforating Co., 614 North Union Ave., is having plans prepared for the construction of a 1 story factory to contain 60,000 sq.ft. of floor space, for the manufacture of mining screens, on Fillmore and Waller Sts. Estimated cost $275,000. G. C. Nimmons Co., 122 South Michigan Ave., Archts.

Ill., Chicago—E. Neylon, 1637 East 79th St., awarded the contract for the construction of a 1 story, 50 x 200 ft. garage on 78th St. and Stony Island Ave. Estimated cost $40,000.

Ia., Sioux City—The Sioux City Brick & Tile Co., 9 West 3rd St., awarded the contract for the construction of a 5 story, 60 x 80 ft. machine house, also six 1 story, 44 x 136 ft., 44 x 126 ft., 60 x 60 ft., 38 x 59 ft., 38 x 44 ft. and 24 x 52 ft. factory buildings, on Riverside St. Estimated cost $100,000. D. P. Mahoney, Pres.

Kan., Augusta — The Schoeb Motor Co. will build a 1 story, 125 x 125 ft. garage. Estimated cost $40,000. Noted Feb. 15.

La., Alexandria — The Texas & Pacific Ry., Texas & Pacific Ry. Bldg., Dallas, Tex., plans to build shops and terminals, including round house, distribution yards, storage tracks, repair shops, supply house, etc., here. Estimated cost $1,000,000. These will be used jointly by the Texas & Pacific Ry. and the Missouri Pacific R.R. E. F. Mitchell, Ch. Engr.

Mass., Everett—The Beaudry Co., Inc., 45 Bromfield St., Boston, awarded the contract for the construction of a 1 story, 70 x 142 ft. foundry for the manufacture of power hammers on the Parkway, here. Estimated cost $50,000.

Mass., Foxboro—The Foxboro Co., Inc., plans to build a 4 story, 65 x 160 ft. and 55 x 60 ft. addition to its factory for the manufacture of gauges, etc. Estimated cost $135,600. Engineer or architect not announced.

Mass., Springfield — The Mack Motor Truck Co., 278 Chestnut St., awarded the contract for the construction of a 2 story, 80 x 200 ft. garage and service station with a 35 x 80 ft. ell, on State St. Estimated cost $60,000.

Mass., West Springfield—The Smith Springfield Body Corp. will soon award the contract for the construction of a 1 story, 90 x 470 ft. factory. Estimated cost $125,000. Private plans.

Mich., Big Rapids—Turner, Crimmins & Waters are having plans prepared for the construction of a 1 story, 180 x 240 ft. garage. Estimated cost $100,000. Lane, Davenport & Peterson, 2320 Dime Bank, Detroit, Archts.

Mo., St. Louis—The Armature Rewinding Co., 3305 Washington Ave., awarded the contract for the construction of a 2 story, 50 x 124 ft. electrical factory at 605-11 North Leonard Ave. Estimated cost $50,000.

Mo., St. Louis—The Missouri, Kansas & Texas Ry., Ry. Exch. Bldg., plans to build repair shops, machine shops, round houses and round house facilities. Estimated cost $1,510,000. F. Ringer, 1520 Ry. Exch. Bldg., Ch. Engr.

N. Y., Buffalo—Badner & Block, 575 Jefferson Ave., are building a garage and machine shop, 90 car capacity.

N. Y., Buffalo—The New York Telephone Co., 44 Church St., plans to build a garage and machine shop, 70 car capacity, in connection with new production and equipment building at 63-81 East Delevan Ave.

N. Y., Lackawanna (Buffalo P. O.)—The Bd. Educ. plans to build several new schools, including a trade school. Cost will exceed $500,000. Engineer or architect not selected.

N. Y., Lowville—The Acme Road Mchy. Co., Frankfort, plans to build an 80 x 300 ft. factory for the manufacture of road machinery, here. Cost between $50,000 and $60,000.

N. Y., New York—The city, Room 2034, Municipal Bldg., will soon receive bids for the construction of a 1 story, 50 x 90 ft. addition to its garage on 90th St. and East River. Estimated cost $50,000. Private plans.

N. Y., Orchard Park—A. J. Schreiber, Jr., Hamburg, has purchased site and plans to build a garage on Buffalo and West Quaker Sts., here. Cost between $40,000 and $50,000.

O., Cleveland — The Federal Brass Co., 1000 Champlain Ave., awarded the contract for the construction of a 1 and 2 story, 89 x 139 ft. factory on East 27th St. near Payne Ave. Estimated cost $60,000. R. H. Hunger, Treas.

O., Cleveland—The Forest City Fdry. & Mfg. Co., 1220 Main St., manufacturer of hot air furnaces, awarded the contract for the construction of a 1 story, 120 x 300 ft. and 40 x 40 ft. foundry and cupola on West 90th St. along tracks of Cleveland, Cincinnati, Chicago and St. Louis Ry. Estimated cost $200,000. A. Gerdum, Pres. Noted Feb. 1.

O., Cleveland—The Natl. Lamp Wks. of the General Electric Co., Nela Park, awarded the contract for the construction of a 3 story, 96 x 325 ft. addition to its factory on East 152nd St. Estimated cost $190,000.

O., Galion—E. M. Freese & Co., manufacturer of clayworking machinery, are having plans prepared for the construction of a 1 story foundry and pattern shop. Lockwood, Greene & Co., Hanna Bldg., Cleveland, Engrs. and Archts.

O., Shelby—The Shelby Spring Hinge Co. awarded the contract for the construction of a 2 story, 40 x 162 ft. addition to its factory. Estimated cost $75,000. L. D. Malone, Mgr. Noted Mar. 8.

Pa., Charlerol — J. M. Beall & Son, Archts., Monessen, will receive bids until Mar. 30 for the construction of a 2 story, 66 x 100 ft. garage. Estimated cost $50,000.

Pa., Galeton—The Keystone Garage Co. will receive bids until Apr. 7 for the construction of a 1 story, 75 x 126 ft. garage. Estimated cost $40,000. H. Haskell, Hulett Bldg., Elmira, N. Y., Archt.

Pa., Johnstown—The Trabold Motors Co., Swank Bldg., plans to build a 1 story, 100 x 250 ft. automobile factory along tracks of the Pennsylvania R.R. Estimated cost $150,000. Engineer or architect not selected.

Pa., New Bethlehem—Tower Bros. will build a 2 story, 52 x 108 ft. garage. Estimated cost $40,000.

Pa., Pittsburgh—The Webster Ave. Garage Co., c/o J. S. Long, Archt., Citizens' Savings Bank, awarded the contract for the construction of a 3 story, 54 x 110 ft. garage on Webster Ave. Estimated cost $40,000. Noted Mar. 22.

Pa., Primos — The Pennsylvania Lawn Mower Co., 1615 North 23rd St., Phila., awarded the contract for the construction of a 1 story, 110 x 220 ft. foundry, here. Estimated cost $190,000.

Pa., Warren—The Jacobson Gas Engine Co. plans to rebuild its plant on the East Side, which was destroyed by fire. Estimated cost $150,000. Engineer or architect not announced.

R. I., Providence—B. D. Aldrich, 144 Westminster St., awarded the contract for the construction of a 5 story, 70 x 200 ft. garage, automobile sales and service station on Orange St. Estimated cost $200,000.

R. I., Providence—The M. F. Williams Co., 409 Pine St., awarded the contract for the construction of a 1 story, 50 x 160 ft. jewelry plant with ell 30 x 50 ft. Estimated cost $40,000.

Tex., Houston — R. C. Duff, 802 Carter Bldg., recently purchased the Beaumont & Great Northern, and Trinity & Sabine Rys. and plans to extend lines and to build shops. Cost, including equipment, to exceed $4,000,000.

Tex., Waco — The Missouri, Kansas & Texas Ry., Ry. Exch. Bldg., St. Louis, Mo., plans to build locomotive shops and round house facilities, here. Estimated cost $1,166,000. F. Ringer, 1520 Ry. Exch. Bldg., St. Louis, Mo., Ch. Engr.

W. Va., Clarksburg—The Carmichael Motor Co. awarded the contract for the construction of a 2 story, 85 x 126 ft. garage on South 6th St. Estimated cost $65,000. Noted Oct. 12.

W. Va., Follansbee — The Sheet Metal Specialty Co. will soon receive bids for the construction of a 2 story, 82 x 161 ft. and a 42 x 79 ft. warehouse and galvanizing building. Estimated cost $150,000. R. M. Trimble, Ferguson Bldg., Pittsburgh, Archt.

W. Va., Huntington—H. T. Simms and G. Keller, Robson & Pritchard Bldg., will build a 3 story, 60 x 150 ft. garage on 4th Ave. Estimated cost $50,000.

Wis., Chilton—Hingess & Bessler, Kiel, awarded the contract for the construction of a 1 story, 60 x 150 ft. garage, here. Estimated cost $40,000. Noted Feb. 15.

Wis., La Crosse—The Cameron Motor Car Co., 127 South 6th St., awarded the contract for the construction of a 1 story, 60 x 147 ft. garage. Estimated cost $50,000. Noted Feb. 1.

Wis., Madison—C. Tantillo, Regent St. and West Washington Ave., awarded the contract for the construction of a 1 story, 40 x 60 ft. garage and repair shop. Estimated cost $40,000.

Wis., Stevens Point—R. E. Newby, 212 Strong Ave., will build a 2 story, 70 x 124 ft. garage on Church and Main Sts. Estimated cost $50,000. Noted Mar. 8.

Ont., Cedar Springs—H. Downey and H. Dewar plan to rebuild a garage and repair shop. Estimated cost $42,000.

Ont., Toronto — The Canadian General Electric Co., 212 King St., W., plans to repair and equip electric vacuum tube factory, which was damaged by fire. Loss $250,000. Private plans.

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